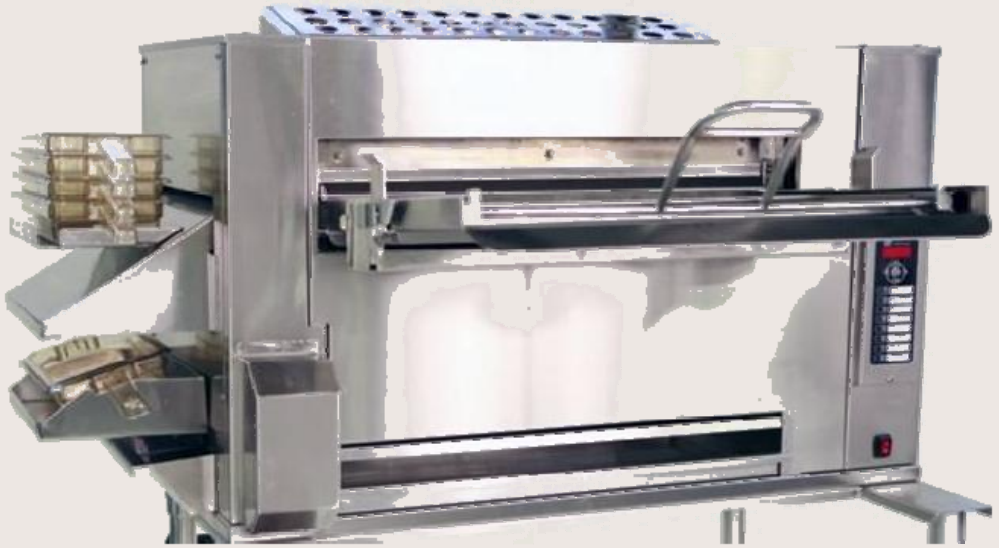
Flexible Batch Broiler



Agenda

- Introduction
- Broiler Operation Sequence
- Safety/General Specifications
- Subassemblies
- 10 Minute Break
- Electrical System
- Gas Burner System
- Operators Maintenance
- Parts
- 10 Minute Break
- Questions/Certification Test

Partnered

With

"Your Solutions Partner"

To Develop A Revolutionary

New Flexible Batch Broiler

Exclusive To Burger King

Burger King

Approached

Duke

Manufacturing

With A List

Of Design

Objectives

- **Reduce Energy Costs**
- **Reduce Overall Floor Space**
- **Fit Under Existing Hood System**
- **Flexibility For Future New Menu Items**
- **Reduce Labor Costs**
- **Reduce Cleaning Down Time**
- **Single Step Loading/Unloading-Batch Cooking**
- **Eliminate Prep Work-Defrosting**
- **Increase Product Consistency**
- **Reduce Equipment Cost**

What is a Batch Broiler?

Allows the operator to cook product in batches to increase flexibility, cooks product faster, provide more consistent quality, provides faster product changeover while reducing labor and energy use.

Broiler
Operating Sequence

Startup-

After powering on the unit the broiler will go into a preheat mode to reach the proper operating temperature of 680 degrees F.

The controller will read “rdY” for ready when the unit is properly up to temperature and the light above the controller will also go out to indicate the unit is ready to load.

Red light will go off when unit is ready to load

Controller has reached operating temperature and ready to load

Broiler
Operating Sequence

Product Staging-

Once proper operating temperature is reached the product to be cooked is placed onto the loader. The product is placed frozen onto the loader. The cooking parameters of the controller are designed to operate with frozen product.

Loading frozen Whoppers onto broiler loading assembly

Broiler

Operating Sequence

Product Loading-

The product is loaded into the unit by pushing the loader forward in a steady motion. As the loader is pushed forward the loading door is opened. Once the loader is pushed forward all the way the handle on the loader is pushed down and loader pulled back in a steady motion with the handle in the down position to clear the product placed on the back row of the loader. A PHU pan must always be placed in the discharge area in case an emergency discharge of product is needed plus to catch the product at the end of the cooking cycle.

Push forward in steady even motion

After completely inserted push down on handle

With handle pushed down pull back to completely remove pusher from inside broiler

Broiler
Operating Sequence

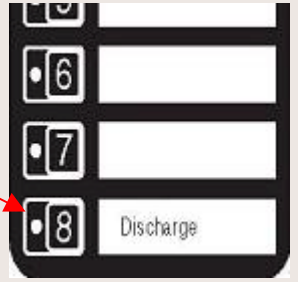
Product Cooking-

After the product is loaded the operator chooses the correct recipe menu on the controller and depresses the corresponding menu button. At this time the controller will cook the product in accordance to the parameters set for the menu item.

At this point if an error in loading of the product occurred or a failure of the broiler has occurred the operator has 15 seconds to hit the discharge button on the controller After 15 seconds the broiler will go through a complete cook cycle even if there has been an ignition failure. The operator then can hit the approprite menu key and hold for 3-5 seconds.

Whopper program chosen after loading of frozen Whoppers

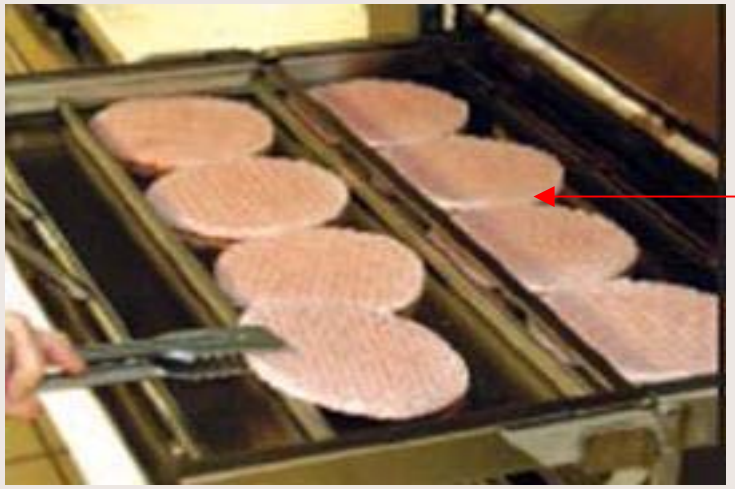
Discharge key can be hit within first 15 seconds in case of problem



Broiler
Operating Sequence

Prepping Next Load-

The next product batch can now being placed on the loader tray. Being a batch broiler product can immediately be placed into the broiler after the prior load has completed the discharge cycle as the product is all cooked in the same cook cycle.



Frozen Whoppers being loaded next batch run

Broiler
Operating Sequence

End of Cooking Cycle-

When the cooking cycle is complete the conveyor will rotate the cook chain ½ of a revolution. This will discharge the product out the side of the broiler and into a PHU (product holding unit) pan which is then directly loaded into the Duke Food Holding Unit. If the operator failed to hit a menu key for a cook cycle then the operator can hit menu #8 which is a manual discharge function.

As soon as the cook light is off the operator is ready to start a new cook cycle.

Safety

- **Observe all safety information in service manual**
- **Review all information in service manual**
- **No safeties have been bypassed**
- **Properly operating ventilation**
- **All panels installed**

SERVICE MANUAL CONTAINS STEP BY STEP SEQUENCE ON PARTS REPLACEMENT THESE INSTRUCTIONS MUST BE FOLLOWED!!!!!

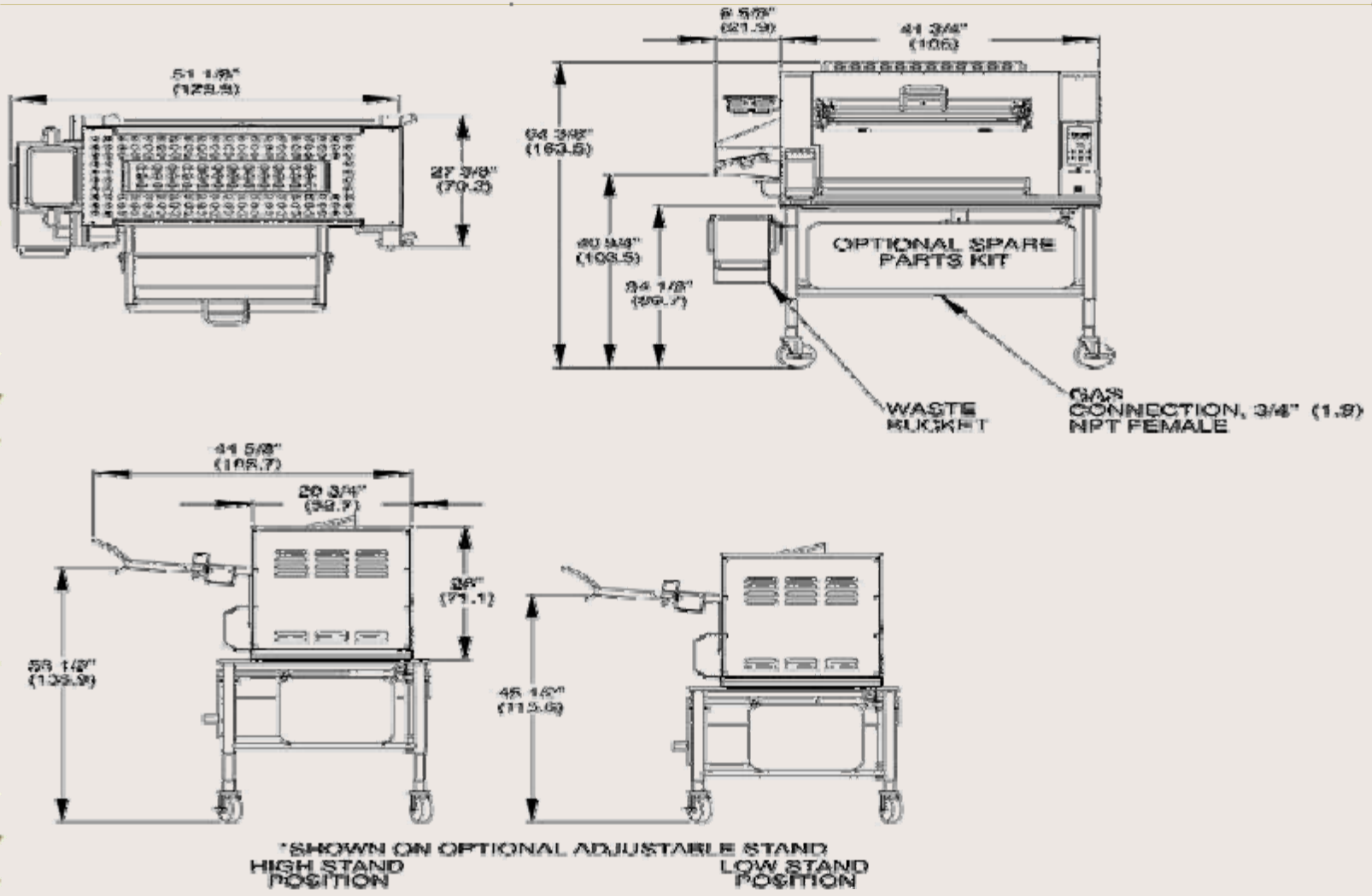
General Specifications

SHIPPING WEIGHT: 530 lbs/240.9 Kg
SHIPPING DIMENSIONS: 48" x 39" x 68"/ 121.9 x 99.1 x 172.7 cm

MODEL NUMBER	ELECTRIC
FBB-NO-120	120VAC, 2A, 60Hz
FBB-NC-120	120VAC, 2A, 60Hz
FBB-PO-120	120VAC, 2A, 60Hz
FBB-PC-120	120VAC, 2A, 60Hz

Model number info:
NO=natural gas without catalyst
NC=natural gas with catalyst
PO=propane gas without catalyst
PC=propane gas with catalyst

General Specifications



Subassemblies
Troubleshooting/Operation

- Operating Controls
- Loader Assembly
- Electrical System
- Gas System
- Conveyor System
- Discharge System

Operating Controls
Controller

1-<u>Power switch</u>

-Turns unit on/off

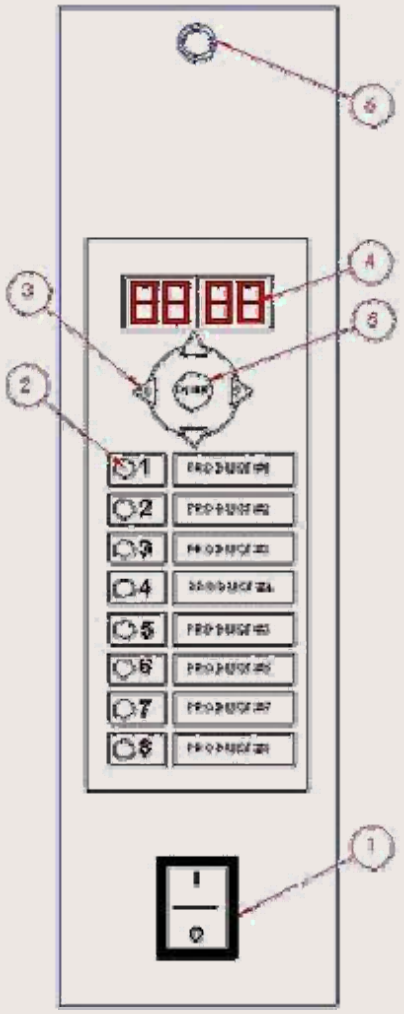
-Self ignition system

2-<u>Product selection keys</u>

-Factory pre-programmed for current products

-Allows additional program recipes for future products

-Number keys also used in programming mode



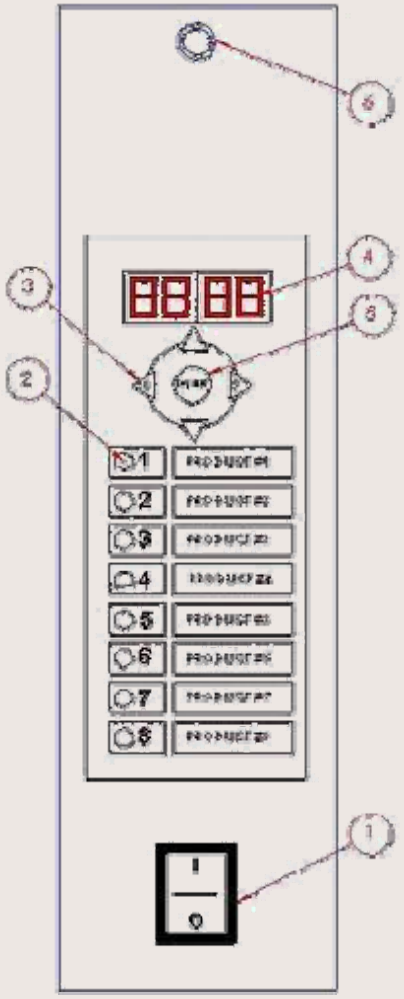
Operating Controls
Controller

3-Arrow keys

Up Arrow-Displays current broiler temp when pressed in run mode. Used during program mode to scroll backward through parameters.

Down Arrow-Displays broiler set-point temp when pressed in run mode. Used during program mode to scroll backward through parameters.

Left & Right Arrows-Moves between characters and parameters when in program mode also used as number 0 and 9 keys.



Operating Controls
Controller

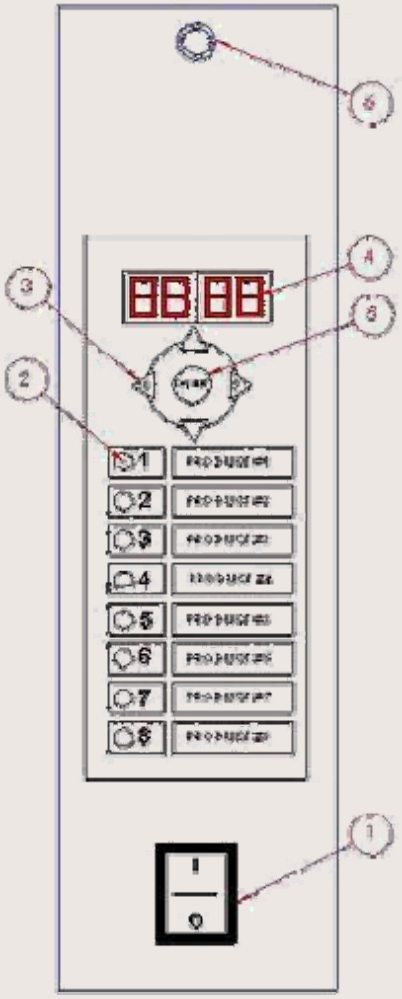
4-<u>Display</u>

5-<u>Enter Key</u>-Used to enter into program mode. When in program mode used to enter parameter and advance through the programming parameters.

6-<u>Cook Light</u>-Light is lit when broiler is in cooking mode. A warning label stating the following:

"IF LIGHT IS ON DO NOT LOAD"

NOTE: In a batch broiler all product is loaded at the same time.



Operating Controls
Basic Operation

Refer to operating manual for complete operating instructions.

The basic operation is as follows:

- **Turn on external ventilation system**
- **Turn the broiler to the on position**
- **Display will show "PRE" (pre-heat cycle)**

  During pre-heat cycle loaded programs will show red indicator light
- **When broiler reaches 680 degrees F the display will show "RDY" (ready) and program lights will turn green**
- **Load product per operating instructions**
- **Press correct product menu (if incorrect product selection has been made it can be changed within first 15 seconds)**

Operating Controls
Basic Operation

- The cook light will be lit during the cooking cycle
- Upon completion of cooking cycle the product will discharge into the holding pan and alarm will sound (if programmed for the alarm feature).
- After the cycle is completed the display will show "RDY" (ready), loaded program lights turn green and cook light is off. The broiler is ready for another cycle

Operating Controls
Other Basic Functions

- Fine cooking adjustment-allows to 30 seconds to be added or subtracted to a program
- Cancel a cook cycle-will stop a cook cycle and discharge all product in broiler
- Check broiler temperature
- Check broiler temperature set point

Operating Controls
Controller Programming Functions

- Always refer to service manual when gaining access to the programming functions
- Two levels of programming
  - -Recipe related programming
  - -Broiler functionality programming
- Diagnostic feature to record failures
- All programs are pre-loaded at factory including replacement Controllers
- All programs and parameters must not deviate from Burger King Corporate or Duke Manufacturing specifications

Operating Controls
Recipe Programming Features

- **Product Identifier-enter alphanumeric product name**
- **Cook temperature-all cook profiles have only one temperature per cycle**
- **Cooking profile**

  -defines cycle parameter for upper burner on/off cycle

  -overall cook time is the total sum of on/off cycles

  -up to 6 cook segments can be loaded per program

  example: Segment 1 On 2:30 Off 1:00

  Segment 2 On 1:30 Off 1:00

  Segment 3 On 1:30 Off 1:00

  Total Cook Time 8 minutes 30 seconds

Operating Controls
Broiler Functionality Programming

- **Idle temperature-temp set point during preheat and idle cycles**
  - **-range 500-900 degrees F**
  - **-factory preset 680 degrees F**
- **Offset parameter-Difference between measured temp and display temp**
  - **-Positive offset-display temp will be below measured temp**
  - **-Negative offset-display temp will be above measured temp**
- **Chain drive time-time required for chain to complete ½ rotation**
  - **-range 1-10 seconds**
  - **-factory default 6 seconds**
  - **-factory default right to left**

Operating Controls
Broiler Functionality Programming

- **Reset Product Counts – Resets diagnostic record of how many times each product key has been depressed**
- **Reset Failure Counts – Resets diagnostic record of how many times a failure to sense flame occurred**
- **Hitting the ► key will return to the first parameter**
- **Hitting the "enter" key will save all new entries into the controller**

Loader Assembly

Basic Operation

The loader assembly is a completely mechanical operation. After placing the product onto the loader the operator pushes the loader forward into the broiler, pushes down on the handle and pulls the loader back. There are limits to the amount of product that can be loaded into the unit (per Burger King specs) however less product can be loaded. It is important that mixed product batches never be cooked as the programs are different for each product. Some product has specific loading procedures, ex. Tender Grill-Heavy Glaze Upward

Loader Assembly
Major Components

- Loader Tray
- Loader

Loader Tray/Loader

Loader

Loader Assembly
Docking Plate/Loader Carriage

The main issue with the loader not functioning correctly other than a damaged loader or loader tray would be an improperly installed loader ramp.

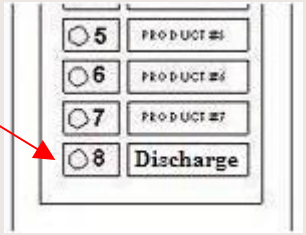
Ensure loader tray is installed and latched correctly. It must sit on to top of the cook chain.

Conveyor Assembly
Basic Operation

The conveyor assembly serves two purposes in the broiler. The cook chain provides the score "char" markings on the product as it is superheated to approximately 750 degrees F.

The conveyor also discharges the product automatically into the PHU pans at the end of the cook cycle by rotating a half of a revolution.

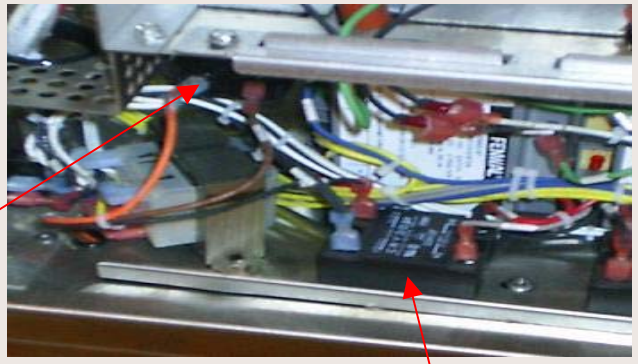
The conveyor can be activated within the first 15 seconds of the cook cycle should a loading problem occur or also can be activated at the end of the cook cycle should the product not discharge (this normally would occur should the operator fail to properly activate a cook cycle. Both these operations are performed by hitting the #8 key on the controller marked discharge.



Conveyor Assembly

Major Components

Drive Motor & Cover



Capacitor

Motor Relay

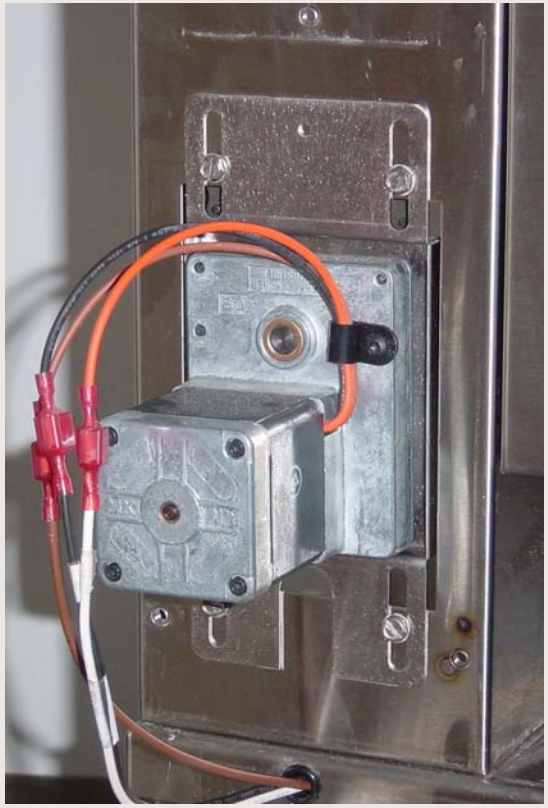
Conveyor (Cook Chain)

Sprockets & Drive Chain

Conveyor Assembly
Drive Motor

Prior to checking the conveyor motor make sure the conveyor is not jammed with food product-refer to troubleshooting guide on how to check for jammed product.

If conveyor chain is not jammed check the motor resistance following the instructions provided in the service manual.



<u>Normal Motor Resistance</u>

Wires to Test	Resistance
Black and Brown	24.2Ω
Black and Orange	24.2Ω
Brown and Orange	49.2Ω

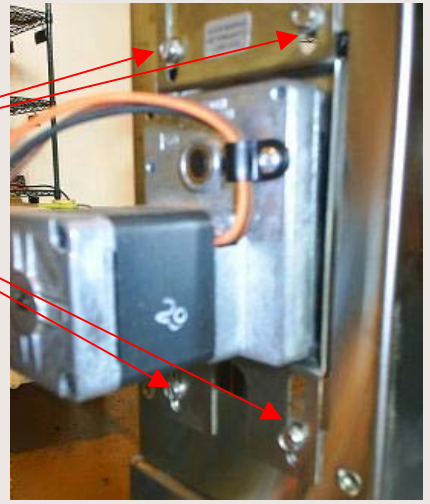
Should the drive motor test ok check the motor capacitor and motor relay which is covered later in this presentation.

Conveyor Assembly
Drive Chain/Sprocket

Drive chain is factory preset. Over time it may need to be adjusted and the chain deflection should set to 3/16”. Moving the bracket up will loosen the chain while moving the bracket down will tighten the chain.

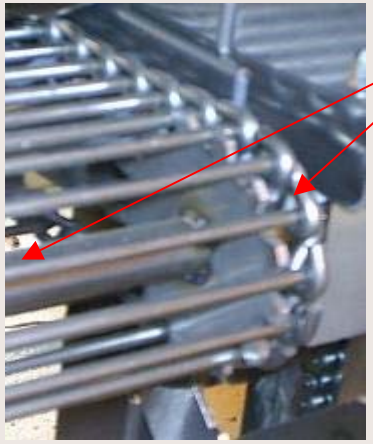
Should the chain and/or sprocket need to be replaced follow the replacement procedures as outlined in the service manual.

Remove the motor cover. Loosen the four screws that hold the bracket in place and move the bracket up or down to loosen or tighten the assembly as needed.



Conveyor Assembly
Conveyor

Individual links on a conveyor (cook chain) can be replaced if damaged. A complete conveyor should only be replaced in the rare occurrence that multiple links have been damaged. Should more than a couple need to be replaced then the entire conveyor (cook chain) must be replaced.



A link runs the complete width of the conveyor chain

Use a link removal tool to properly remove and install conveyor links

Conveyor Assembly Tips

- Conveyor is also referred to as the cook chain.

- Make sure the meat and ash scrapers are installed properly and not damaged (bent or warped-these must be replaced if damaged)

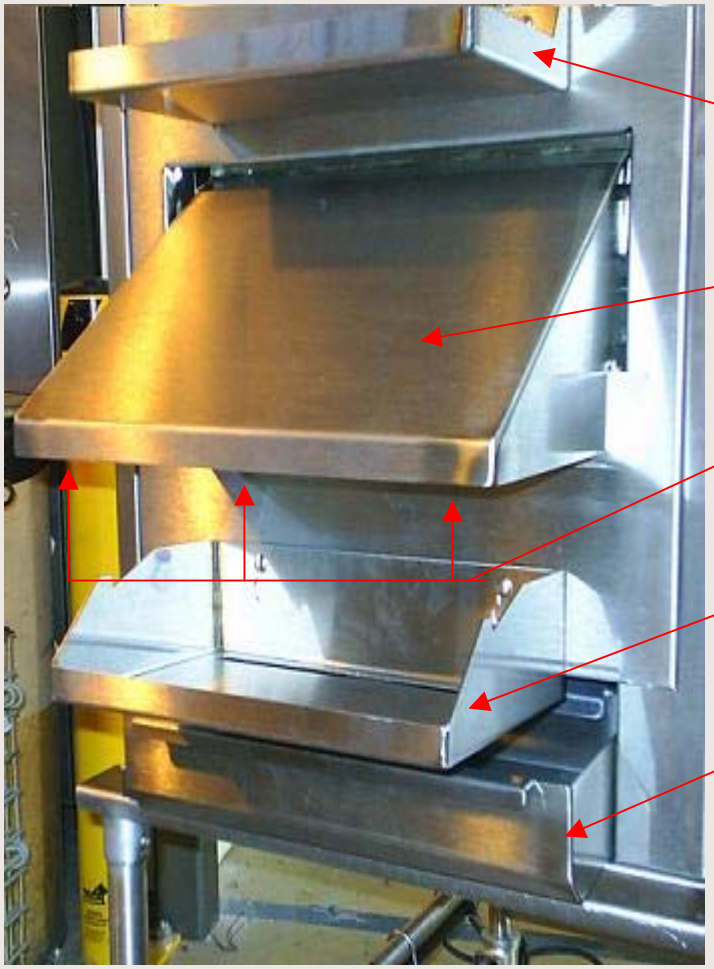
The discharge chute fits onto the pins shown and is placed from the top downward

Discharge Assembly
Basic Operation

When the cook cycle has completed the conveyor (cook chain) will discharge the product out of the side of the unit into a PHU pan by turning one half of a revolution.

PHU stands for "Product Holding Unit" and is designed to fit directly into a product warming unit

Discharge Assembly
Major Components



Product Pan Shelf

Discharge Hood

Discharge Chute(located under discharge hood)

Discharge Pan Holder (PHU pan placed here)

Discharge Grease Pan

Discharge Assembly
Tips

Most common issues with no discharge would be the following:

- **Jammed conveyor (cook chain)**
- **Operator did not hit a program key**
- **Defective controller**
- **Defective motor or relay**

10 Minute Break

Electrical System
Major Subassemblies

- Controller Circuit
- Conveyor Electrical System
- Upper Burner Electrical System
- Lower Burner Electrical System

Refer to the troubleshooting flow chart for operational sequence and troubleshooting component guide for individual component testing procedure

Electrical System
Controller Circuit

Main Components

Power Switch

24 Volt Transformer

Controller

Controller Wiring Harness

Thermocouple Probe

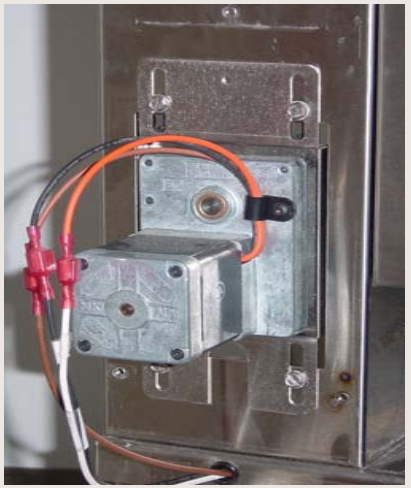
Electrical System
Controller Circuit

- 120VAC is supplied to the Broiler through the on/off switch
- 120 VAC is supplied to primary winding of both transformers.
- 24 VAC on secondary winding of left-side transformer.
- 24 VAC supplies power to the Control.
- The Control senses cook chamber temperature through a Type K thermocouple which is located behind the rear panel.

Electrical System

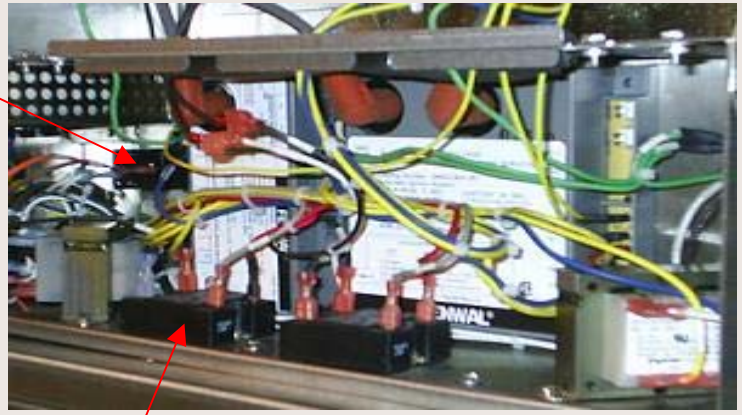
Conveyor Electrical System

Main Components



Conveyor Motor

Conveyor
Motor
Capacitor



Conveyor Motor Relay

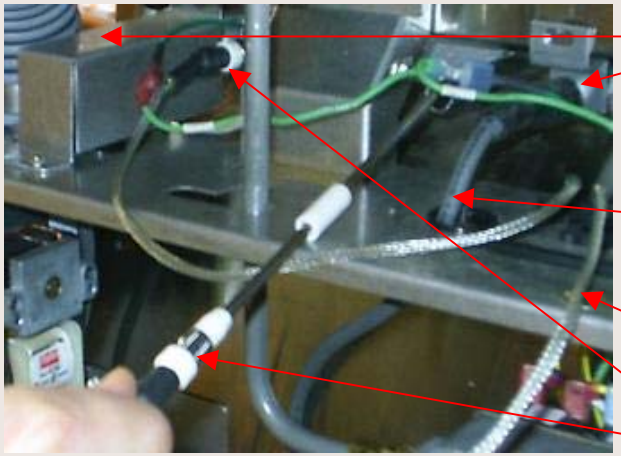
Electrical System

Conveyor Electrical System

- At the end of a cook cycle, the Controller outputs a 24 VAC signal to a solid state relay which closes.
- The output of the solid state relay allows 120 VAC to reach the conveyor motor and start capacitor.
- The Controller ceases to output the 24 VAC signal after the cook chain has rotated a ½ of a revolution.

Electrical System

Upper Burner Electrical System

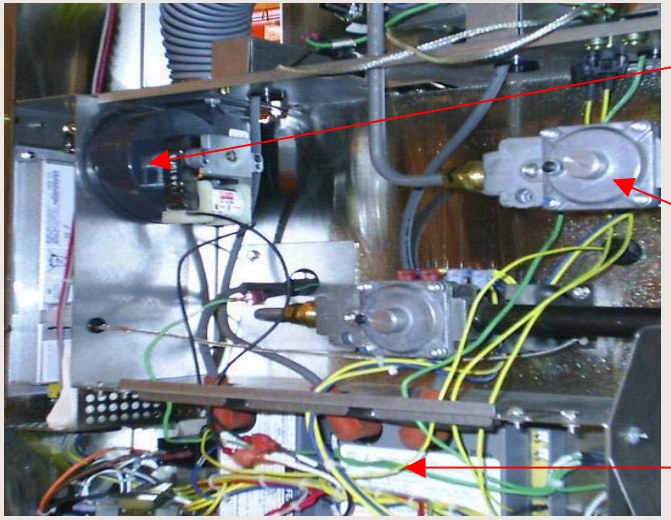


Igniter (2 units under cover)

Igniter Wires (Rubber)

Flame Sensor Wires (Braided)

Flame Sensor (2 units)



Blower Motor

Upper Gas Valve

Upper Ignition Module

Electrical System

Upper Burner Electrical System

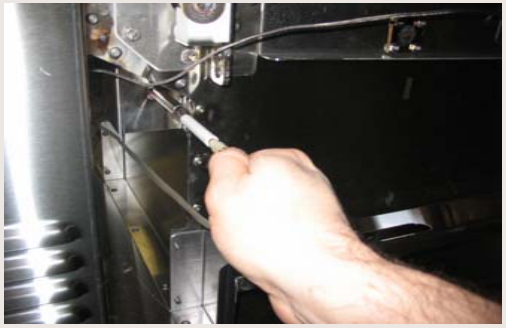
- The Controller initiates a call for ignition of the upper burners. (LED dot can be seen at the top of the Controller display)
- The Controller supplies a 24VAC signal to the upper ignition module.
- The Controller also supplies a 24VAC signal to the blower motor relay which closes and allows 120VAC to the blower motor.
- The upper ignition module supplies a 24VAC signal to the upper gas valve solenoid which allows the gas valve to open.
- The upper ignition module then supplies a high voltage to the igniter to produce spark.
- Air is supplied from the blower motor which mixes with gas at the burner inlets.
- Spark is present at the igniter and ignition occurs.

Electrical System

Lower Burner Electrical System

Main Components

Spark Rod Assy

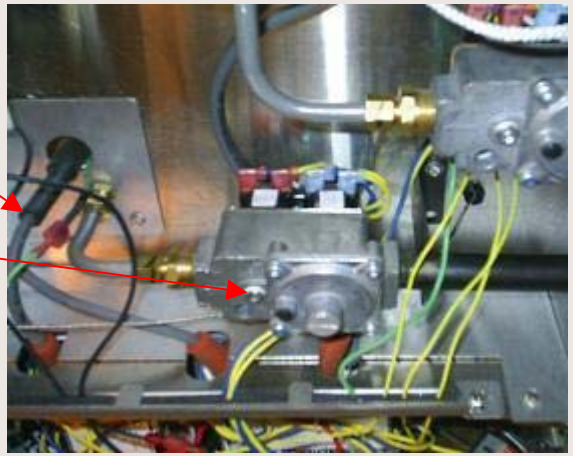


Lower Flame sensor & wire located by removing rear cover

Ignition Wire

Lower Gas Valve

Lower Ignition Module



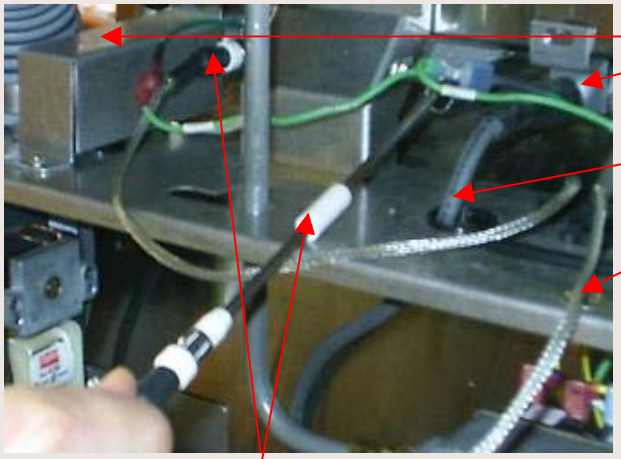
Electrical System

Lower Burner Electrical System

- The Controller initiates a call for ignition of the lower burner. (A separate LED dot can be seen at the top of the Controller display)
- The Controller supplies a 24VAC signal to the lower ignition module.
- The lower ignition module supplies a 24VAC signal to the lower gas valve solenoid which allows the gas valve to open.
- The lower ignition module then supplies a high voltage to the igniter to produce spark.
- Gas mixes with air present at the lower air burner shutter.
- Spark is present at the igniter and ignition occurs.

Gas Burner Assembly

Upper Burner System-Major Components

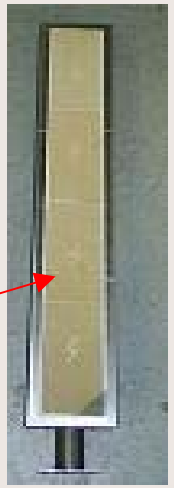


Igniter (2 units under cover)

Igniter Wires (Rubber)

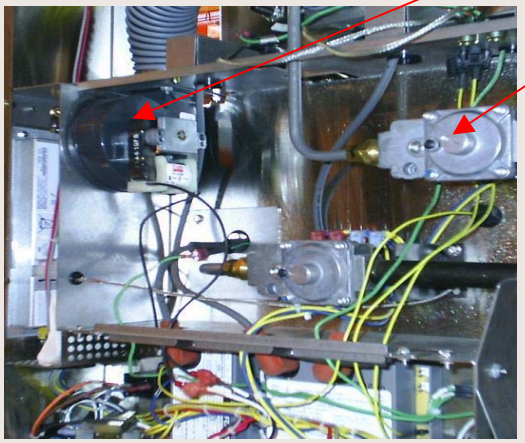
Flame Sensor Wires (Braided)

Infrared Burner (2 units)



Flame Sensor (2 units)

Blower Motor

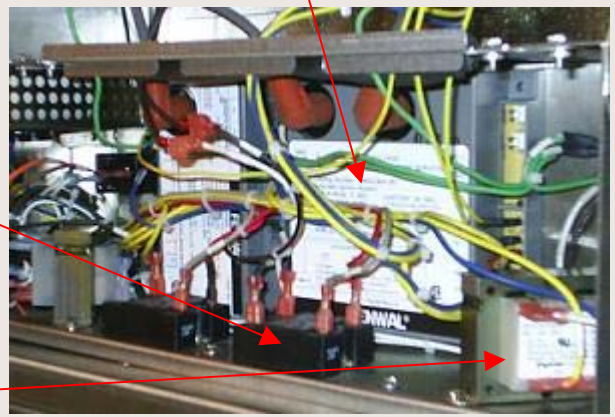


Upper Gas Valve

Blower Motor Relay

24V Transformer

Upper Ignition Module



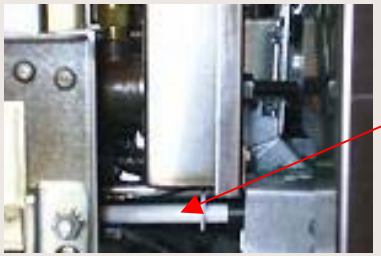
Gas Burner Assembly

Upper Burner System-Operational Sequence

- With ignition present on the upper burners, the upper ignition module must sense that flame is present.
- This is accomplished through flame rectification.
- The upper ignition module applies a voltage between the flame sensor and ground (the burner). With a flame present between the flame sensor and ground, the flame completes the circuit's path. Rectification occurs through the flame and a small DC current can be sensed.
- This measurement can be taken from the upper ignition module and anything above 0.7 µA proves that flame is present.

Gas Burner Assembly

Lower Burner System-Major Components



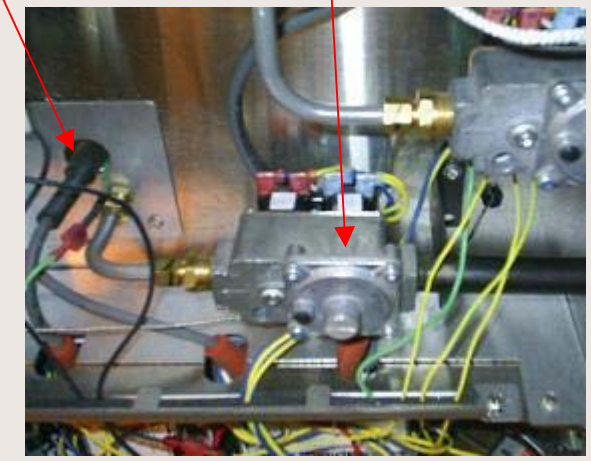
Igniter

Lower Burner

Lower Flame sensor & wire located by removing rear cover

Ignition Wire

Lower Gas Valve



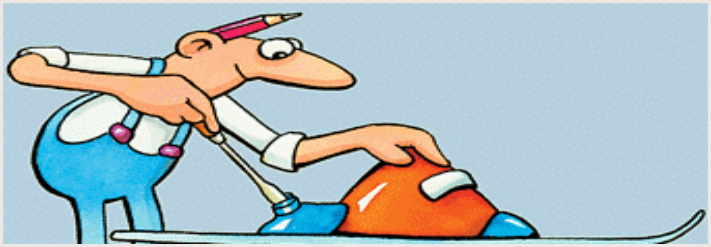
Lower Ignition Module

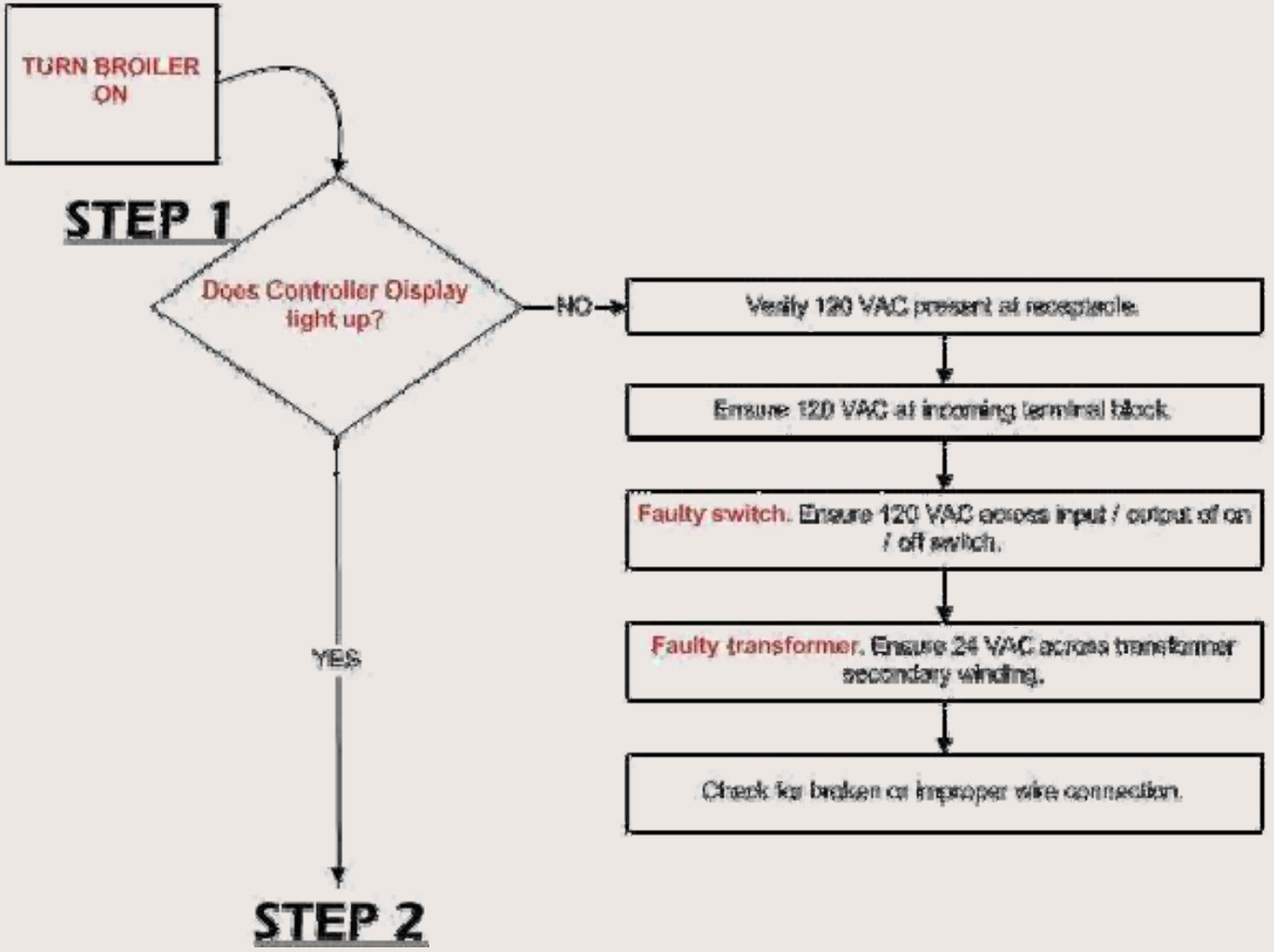
Gas Burner Assembly

Lower Burner System-Operational Sequence

- With ignition present on the lower burner, the lower ignition module must sense that flame is present.
- This is accomplished through flame rectification.
- The lower ignition module applies a voltage between the flame sensor and ground (the burner). With a flame present between the flame sensor and ground, the flame completes the circuit's path. Rectification occurs through the flame and a small DC current can be sensed.
- This measurement can be taken from the lower ignition module and anything above 0.7 µA proves that flame is present.

Troubleshooting



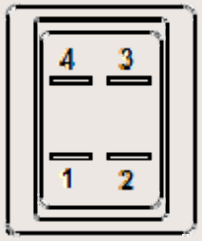

TURN BROILER ON
STEP 1
Does Controller Display light up?
NO
Verify 120 VAC present at receptacle.
Ensure 120 VAC at incoming terminal block.
Faulty switch. Ensure 120 VAC across input / output of on / off switch.
Faulty transformer. Ensure 24 VAC across transformer secondary winding.
Check for broken or improper wire connection.
YES
STEP 2

Troubleshooting
Step 1 Components

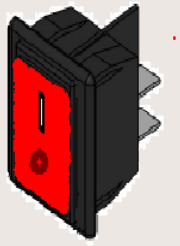
Faulty Switch

Input Voltage Check: 120 vac across wires 1 & 2

Output Voltage Check: 120 vac across wires 3 & 4



Back of Switch



Front of Switch

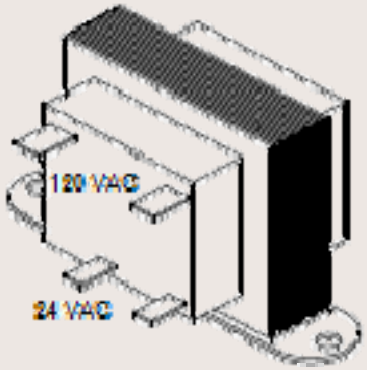
Transformer

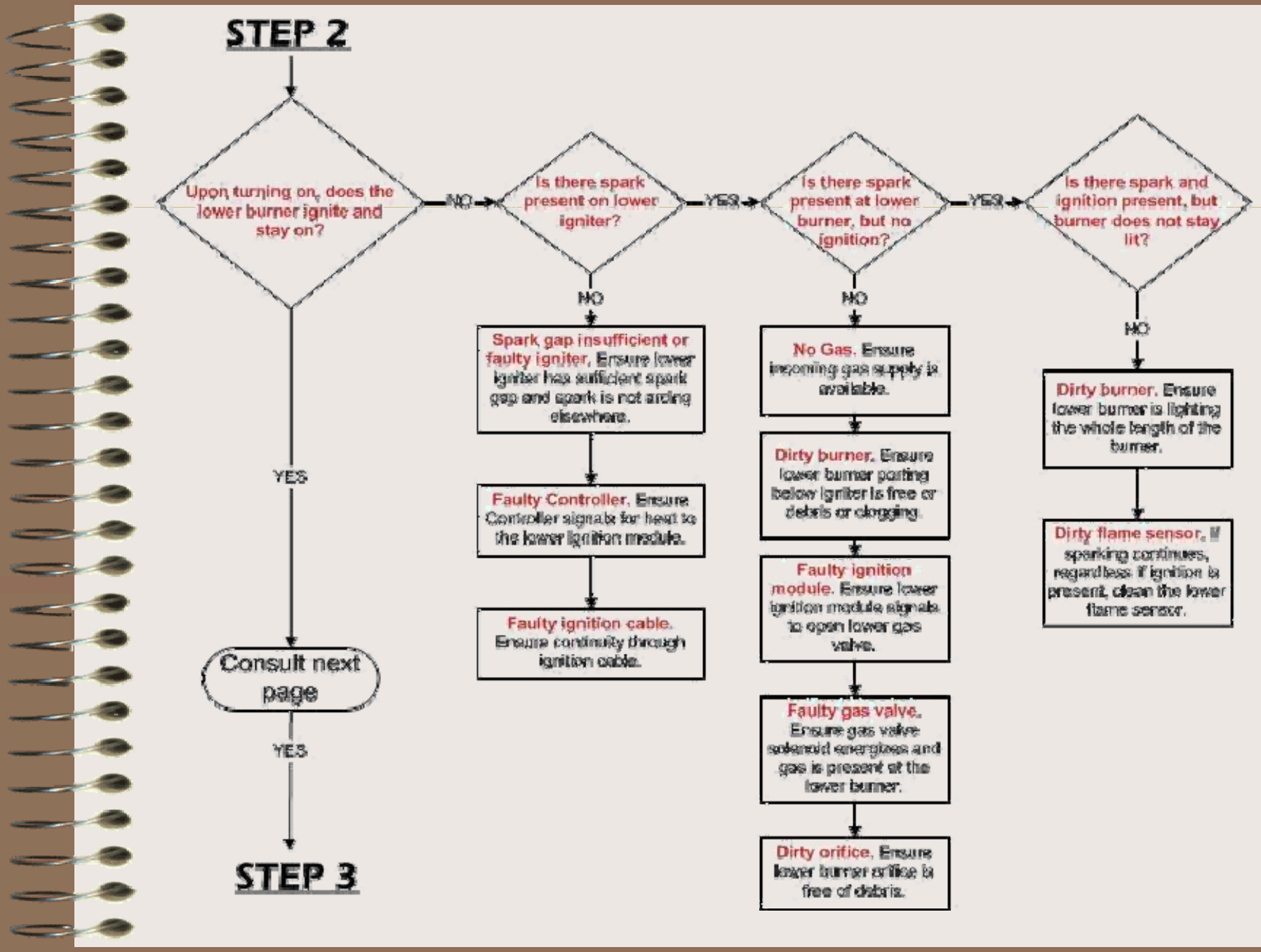
Primary Winding Voltage 120 vac

Resistance Approx.21.8 ohms

Secondary Winding Voltage 24 vac

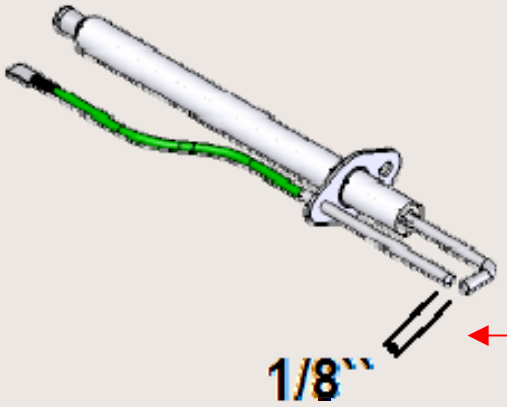
Resistance Approx. 0.8 ohms




STEP 2
Upon turning on, does the lower burner ignite and stay on?
NO
Is there spark present on lower igniter?
YES
Is there spark present at lower burner, but no ignition?
YES
Is there spark and ignition present, but burner does not stay lit?
YES
NO
Spark gap insufficient or faulty igniter. Ensure lower igniter has sufficient spark gap and spark is not arcing elsewhere.
Faulty Controller. Ensure Controller signals for heat to the lower ignition module.
Faulty ignition cable. Ensure continuity through ignition cable.
NO
No Gas. Ensure incoming gas supply is available.
Dirty burner. Ensure lower burner porting below igniter is free of debris or clogging.
Faulty ignition module. Ensure lower ignition module signals to open lower gas valve.
Faulty gas valve. Ensure gas valve solenoid energizes and gas is present at the lower burner.
Dirty orifice. Ensure lower burner orifice is free of debris.
NO
Dirty burner. Ensure lower burner is lighting the whole length of the burner.
Dirty flame sensor. If sparking continues, regardless if ignition is present, clean the lower flame sensor.
YES
Consult next page
YES
STEP 3

Troubleshooting
Type 2 Components

Lower Igniter

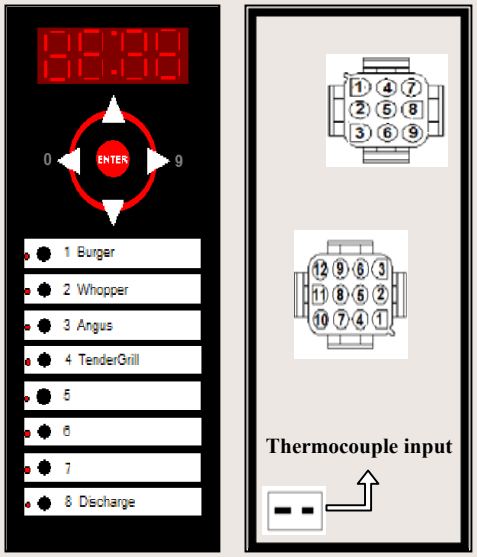


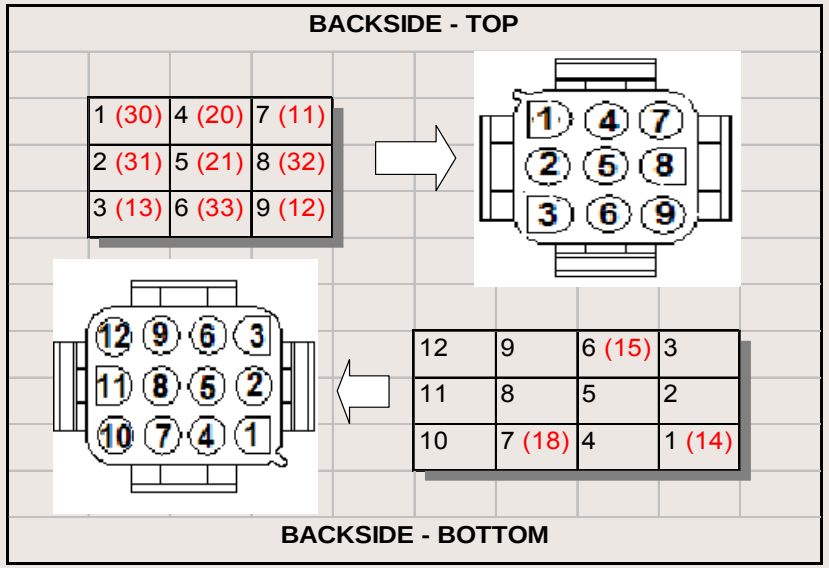
Measure spark gap

Troubleshooting

Step 2 Components

Faulty Controller





Wires 11 & 12 - Input **Power 24 VAC**
Wires 14 & 18 - Input **Detect Lower Valve Open Signal 24 VAC**
Wires 14 & 15 - Input **Detect Upper Valve Open Signal 24 VAC**
Wires 13 & 14 - Input **Detect Upper Ignition Module Power 24 VAC**
Wires 30 & 33 - Output **Cook Light 24 VDC**
Wires 30 & 31 - Output **Conveyor Motor Relay 24 VDC**
Wires 30 & 32 - Output **Blower Motor Relay 24 VDC**
Wires 14 & 20 - Output **Lower Ignition Module Call for Heat 24 VAC**
Wires 14 & 21 - Output **Upper Ignition Module Call for Heat 24 VAC**

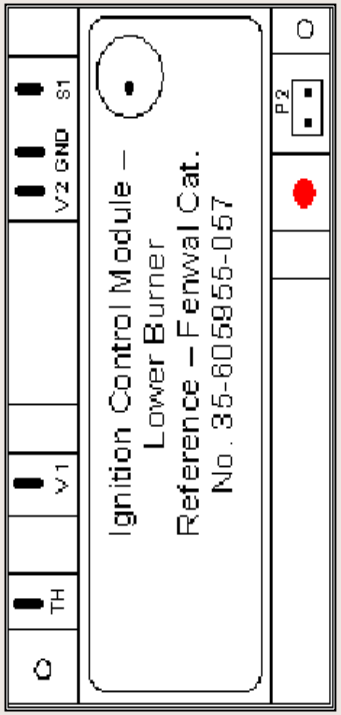
Troubleshooting

Step 2 Components

<u>Ignition Cable</u>-Check for continuity

through lower ignition cable

<u>Lower Ignition Module</u>



<u>Input Voltage Check</u>

Power - 24 VAC across TH & GND from controller

<u>Output Voltage Check</u>

24 VAC across V1 & V2 to lower gas valve

-- Diagnostic LED

Flash indication will occur once immediately after the failure.

2 flashes = Have flame, but no call from heat across TH & GND

3 flashes = Ignition Lockout (only after 3 unsuccessful attempts to ignite and sense flame).

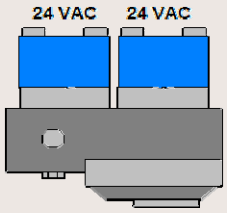
15 second ignition attempt

5 second inter purge

Sparking will stop if flame sense measures above 0.7 micro amps.

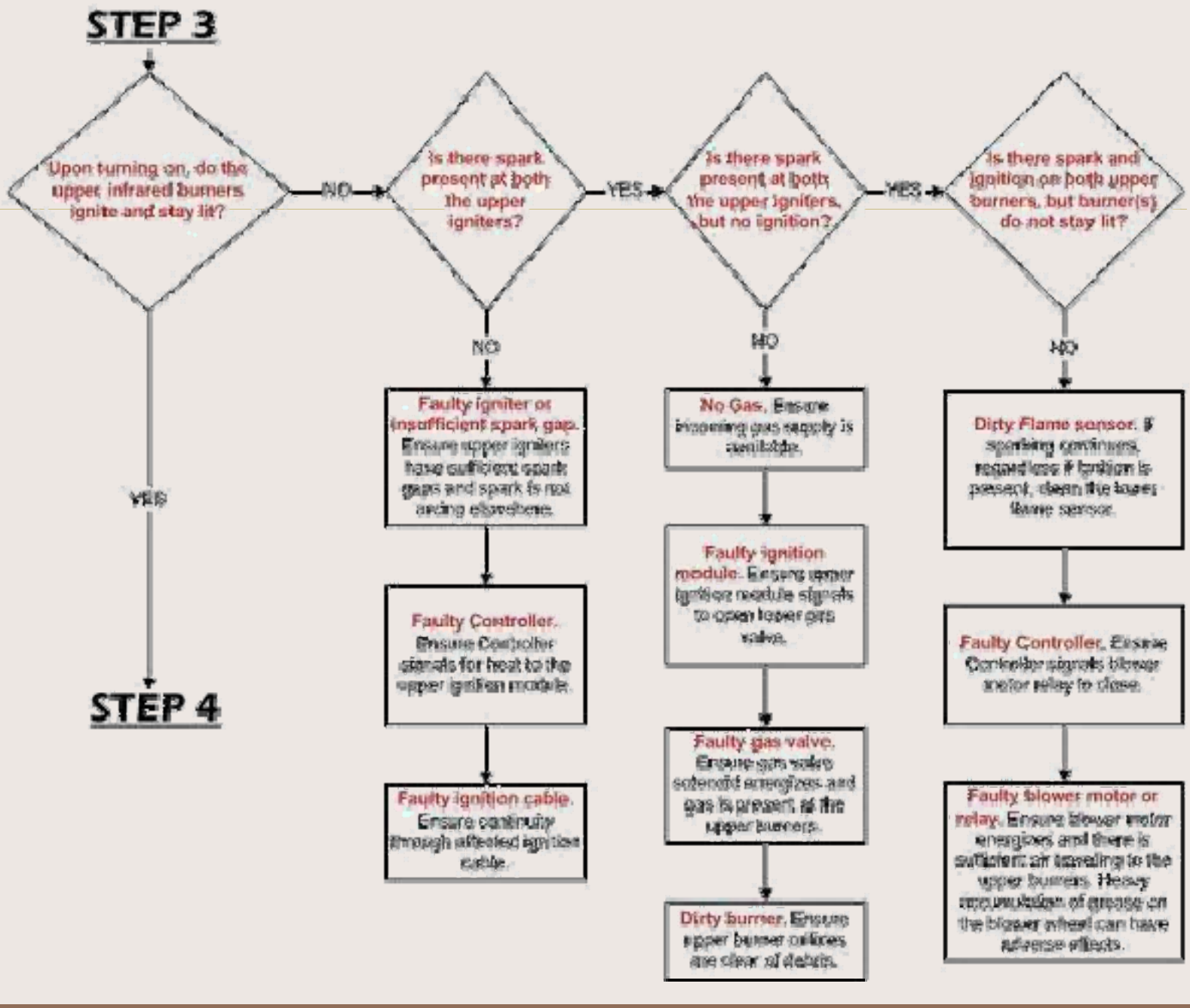
Troubleshooting
Step 2 Components

Lower Gas Valve



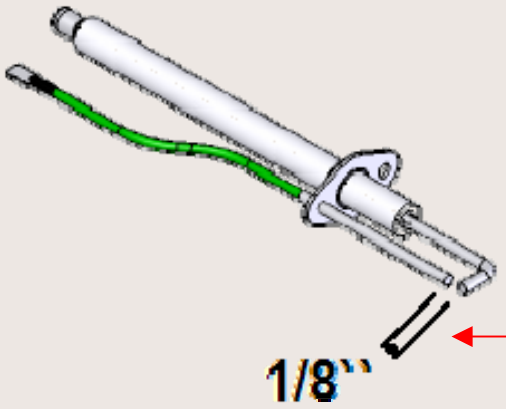
Input Voltage Check
24 VAC across each solenoid from lower ignition module

Output Voltage Check
Test pressure tap for open valve with manometer


STEP 3
Upon turning on, do the upper infrared burners ignite and stay lit?
NO
YES
Is there spark present at both the upper igniters?
YES
Is there spark present at both the upper igniters, but no ignition?
YES
Is there spark and ignition on both upper burners, but burner(s) do not stay lit?
NO
Faulty igniter or insufficient spark gap. Ensure upper igniters have sufficient spark gaps and spark is not arcing elsewhere.
Faulty Controller. Ensure Controller signals for heat to the upper ignition module.
Faulty ignition cable. Ensure continuity through affected ignition cable.
NO
No Gas. Ensure incoming gas supply is available.
Faulty ignition module. Ensure upper ignition module signals to open upper gas valve.
Faulty gas valve. Ensure gas valve solenoid energizes and gas is present at the upper burners.
Dirty burner. Ensure upper burner orifices are clear of debris.
NO
Dirty Flame sensor. If sparking continues, repeat test if ignition is present, clean the upper flame sensor.
Faulty Controller. Ensure Controller signals blower motor relay to close.
Faulty blower motor or relay. Ensure blower motor energizes and there is sufficient air travelling to the upper burners. Heavy accumulation of grease on the blower wheel can have adverse effects.
YES
STEP 4

Troubleshooting
Step 3 Components

Upper Igniter

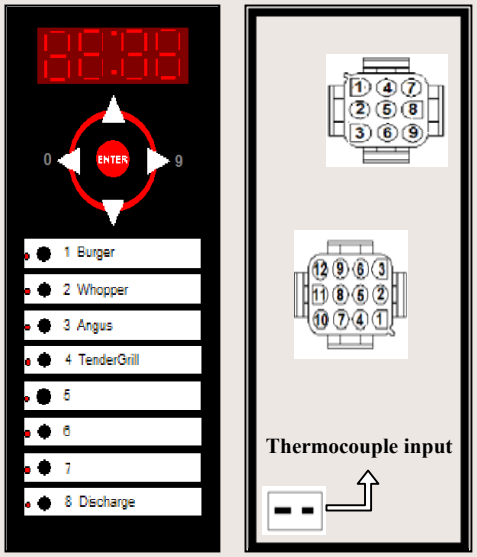


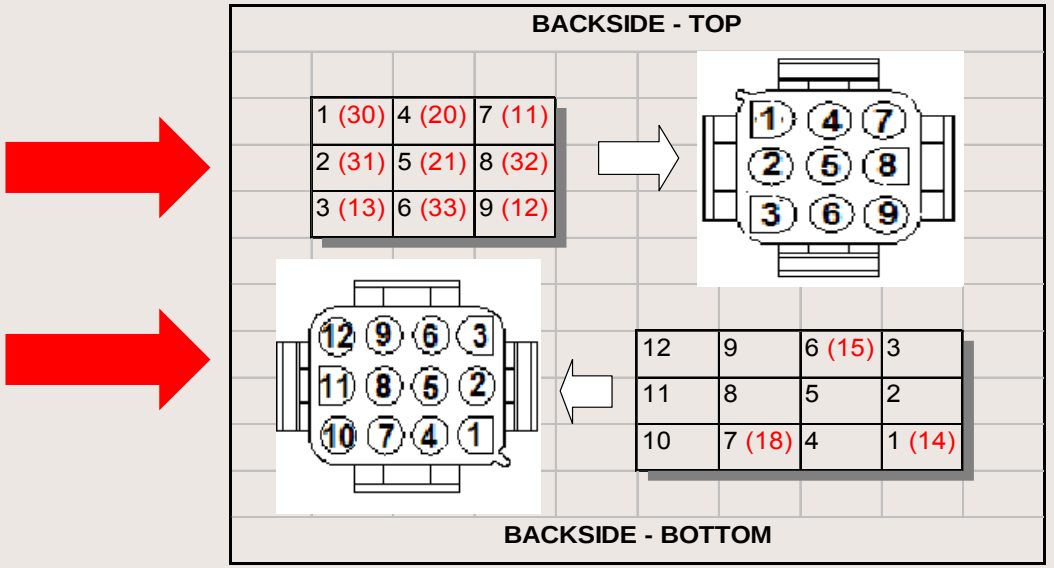
Measure spark gap

Troubleshooting

Step 3 Components

Faulty Controller



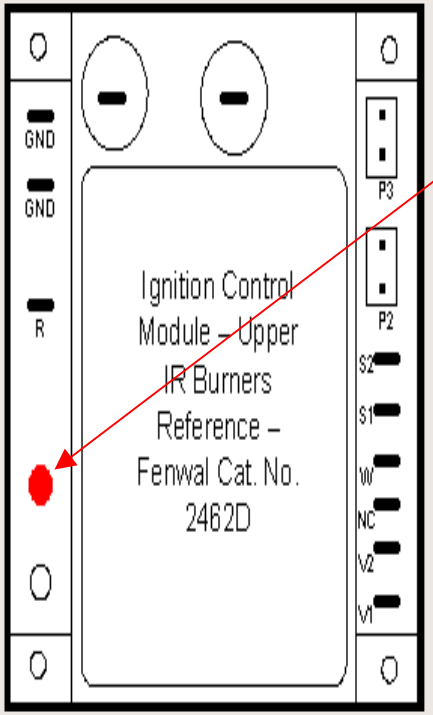


Wires 11 & 12 - Input **Power 24 VAC**
Wires 14 & 18 - Input **Detect Lower Valve Open Signal 24 VAC**
Wires 14 & 15 - Input **Detect Upper Valve Open Signal 24 VAC**
Wires 13 & 14 - Input **Detect Upper Ignition Module Power 24 VAC**
Wires 30 & 33 - Output **Cook Light 24 VDC**
Wires 30 & 31 - Output **Conveyor Motor Relay 24 VDC**
Wires 30 & 32 - Output **Blower Motor Relay 24 VDC**
Wires 14 & 20 - Output **Lower Ignition Module Call for Heat 24 VAC**
Wires 14 & 21 - Output **Upper Ignition Module Call for Heat 24 VAC**

Troubleshooting
Step 3 Components

<u>Ignition Cable</u>-Check for continuity through upper ignition cable

<u>Upper Ignition Module</u>



<u>Input Voltage Check</u>

Power - 24 VAC across R & GND from right side transformer

<u>Output Voltage Check</u>

24 VAC across V1 & V2 to upper gas valve

-- Diagnostic LED

Flash indication will occur once immediately after the failure.

1 flash = Powering on

2 flashes = Have flame, but no call from heat across TH & GND

3 flashes = Ignition Lockout (only after 2 unsuccessful attempts to ignite and sense flame).

4 flashes = Valve relay lockout (indication of internal module failure)

15 second ignition attempt

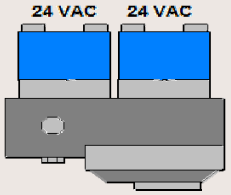
5 second inter purge

Sparking will stop if flame sense measures above 0.7 micro amps

Troubleshooting

Step 3 Components

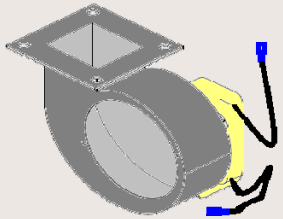
Upper Gas Valve



Input Voltage Check
24 VAC across each solenoid from lower ignition module

Output Voltage Check
Test pressure tap for open valve with manometer

Blower Motor

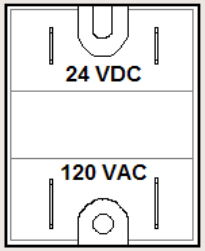


Input Voltage Check
120 VAC across motor leads

Output Voltage Check
Running motor

Resistance Check-Approx 22.2 ohms

Blower Motor Relay



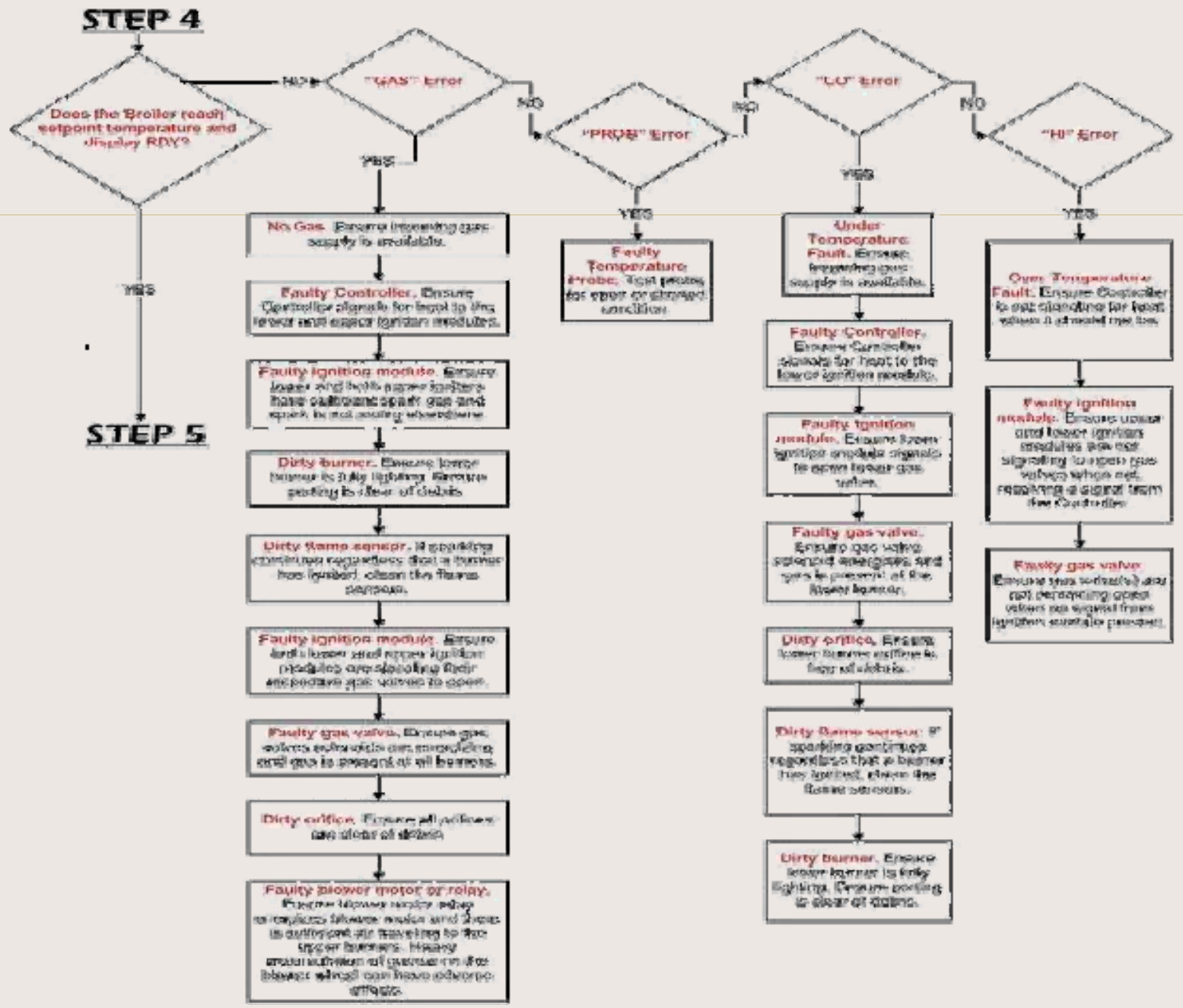
Input Voltage Check
24 VDC across wires 30 & 32 from controller

Output Voltage Check
120 VAC across wires 4&6

Other Relay Tests

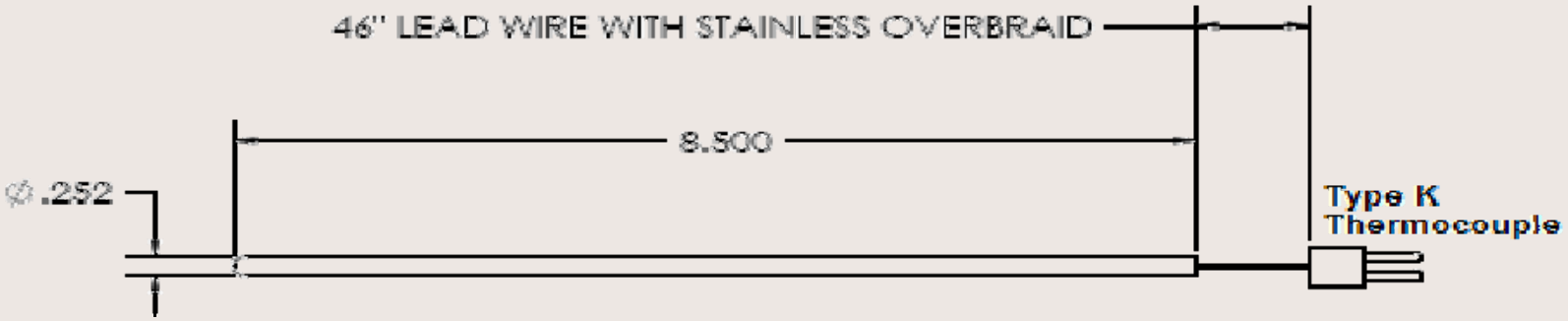
-With 24 VDC input there should be 120 VAC across the output

-With 0 VDC input there should be approx. 0 VAC across output


STEP 4
Does the Broiler reach setpoint temperature and display RDY?
NO
"GAS" Error
NO
"PROBE" Error
NO
"LO" Error
NO
"HI" Error
YES
YES
YES
YES
YES
STEP 5
No Gas. Ensure incoming gas supply is available.
Faulty Controller. Ensure Controller signals for heat to the lower and upper ignition modules.
Faulty ignition module. Ensure lower and both upper ignitors have calibrated spark gap and spark is not occuring elsewhere.
Dirty burner. Ensure lower burner is fully lighting. Ensure venting is clear of debris.
Dirty flame sensor. If sparking continues regardless that a burner has ignited, clean the flame sensors.
Faulty ignition module. Ensure both lower and upper ignition modules are signalling their respective gas valves to open.
Faulty gas valve. Ensure gas valves activate (are energized) and gas is present at all burners.
Dirty orifice. Ensure all orifices are clear of debris.
Faulty blower motor or relay. Ensure blower motor relay is replaced. Ensure motor and fans is turning at the upper burners. Heavy grease buildup on the fans in the blower wheel can have adverse effects.
Faulty Temperature Probe. Test probe for open or shorted condition.
Under Temperature Fault. Ensure incoming gas supply is available.
Faulty Controller. Ensure Controller signals for heat to the lower ignition module.
Faulty ignition module. Ensure lower ignition module signals to open lower gas valve.
Faulty gas valve. Ensure gas valve energized energizes and gas is present at the lower burner.
Dirty orifice. Ensure lower burner orifices is free of debris.
Dirty flame sensor. If sparking continues regardless that a burner has ignited, clean the flame sensors.
Dirty burner. Ensure lower burner is fully lighting. Ensure venting is clear of debris.
Over Temperature Fault. Ensure Controller is not signaling for heat.
Faulty ignition module. Ensure upper and lower ignition modules are not signaling to open gas valves when not requiring a signal from the Controller.
Faulty gas valve. Ensure gas valve(s) are not receiving open valves as signal from ignition module(s) present.

Troubleshooting
Step 4 Components

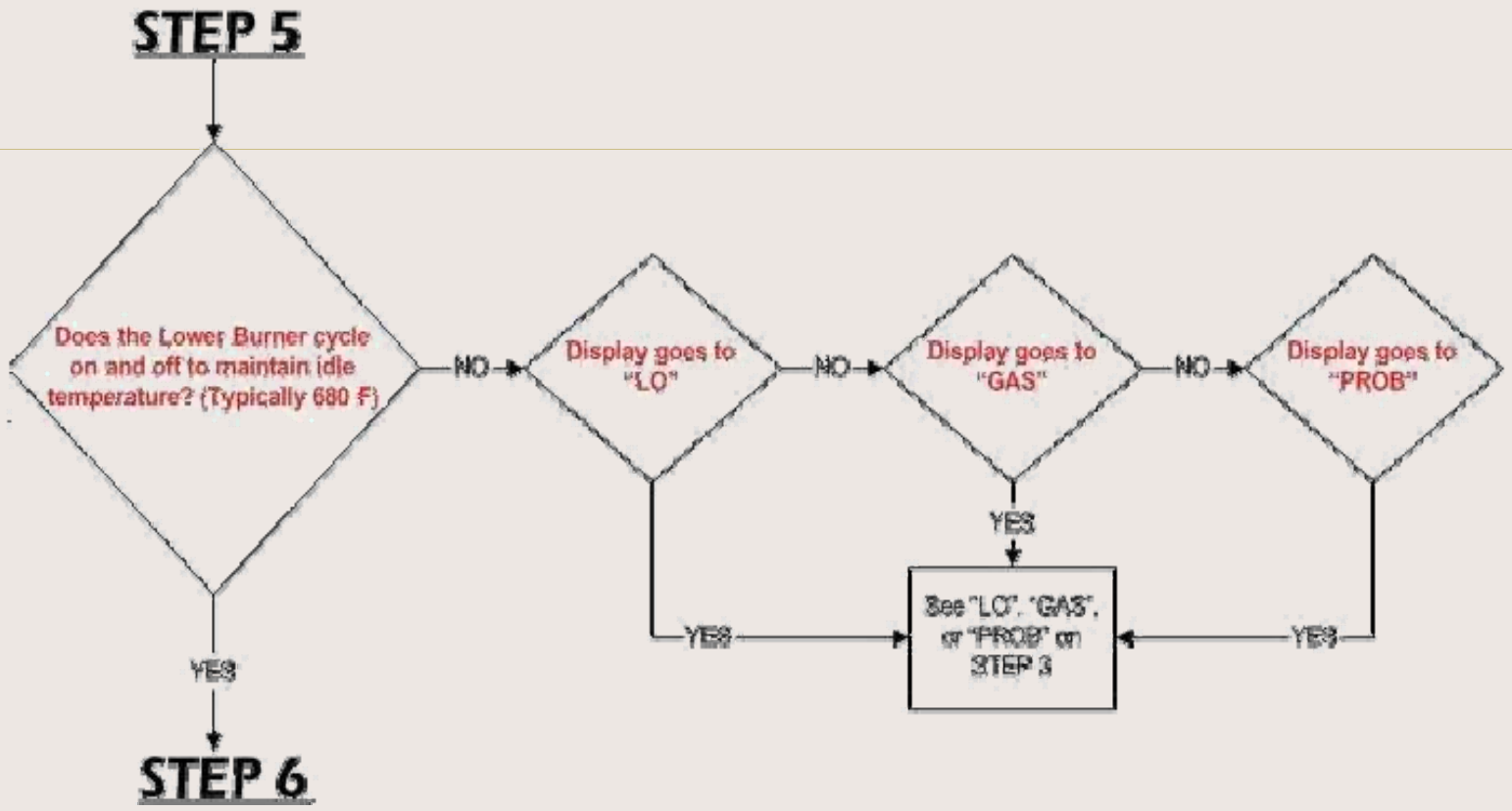
Temperature (Thermocouple) Probe

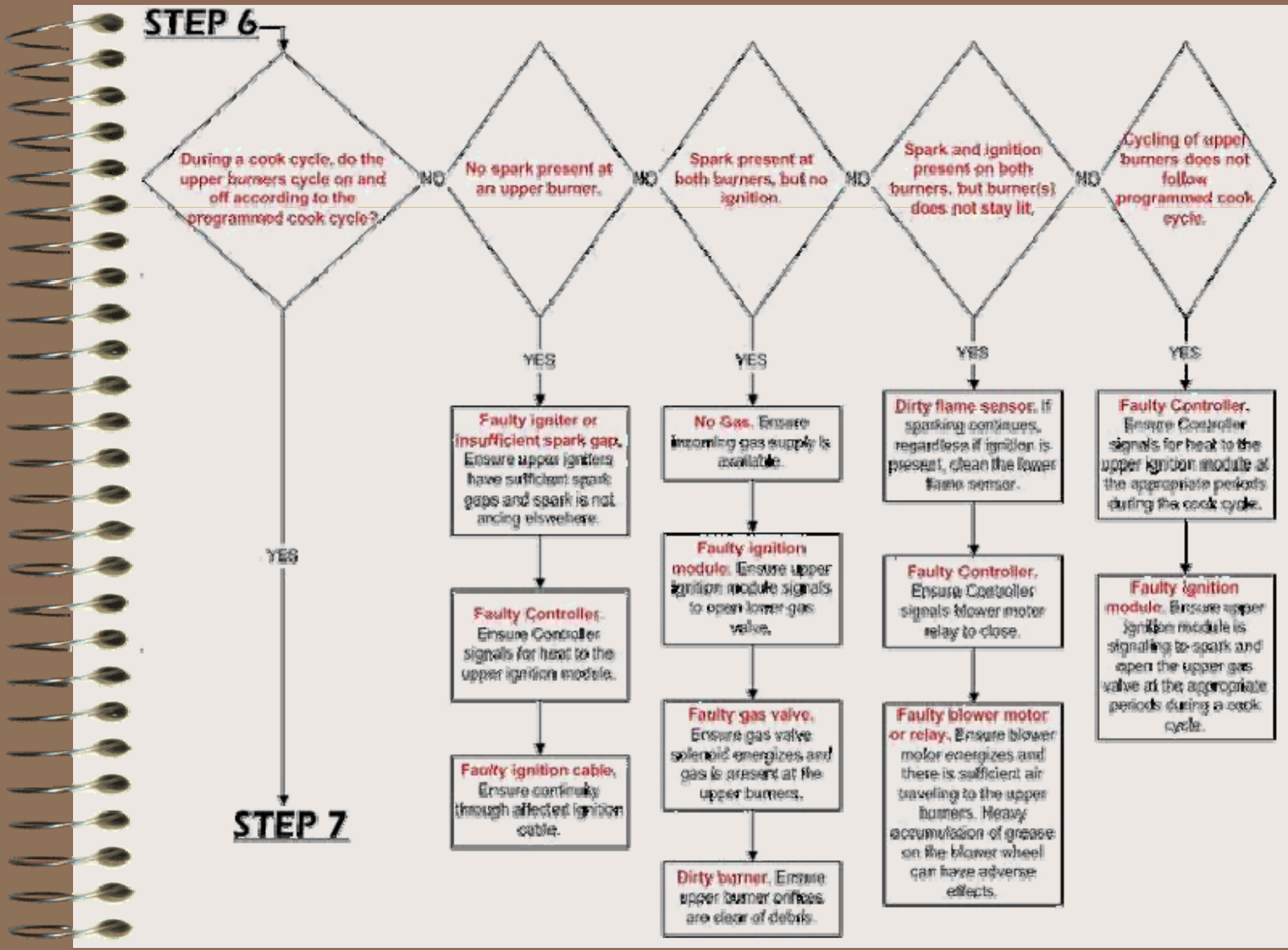


Test for open or shorted condition

Controller-
Lower Ignition Module-
Upper Ignition Module-
Lower Gas Valve-
Upper Gas Valve-
Blower Motor-
Blower Motor Relay-

See prior pages for component troubleshooting

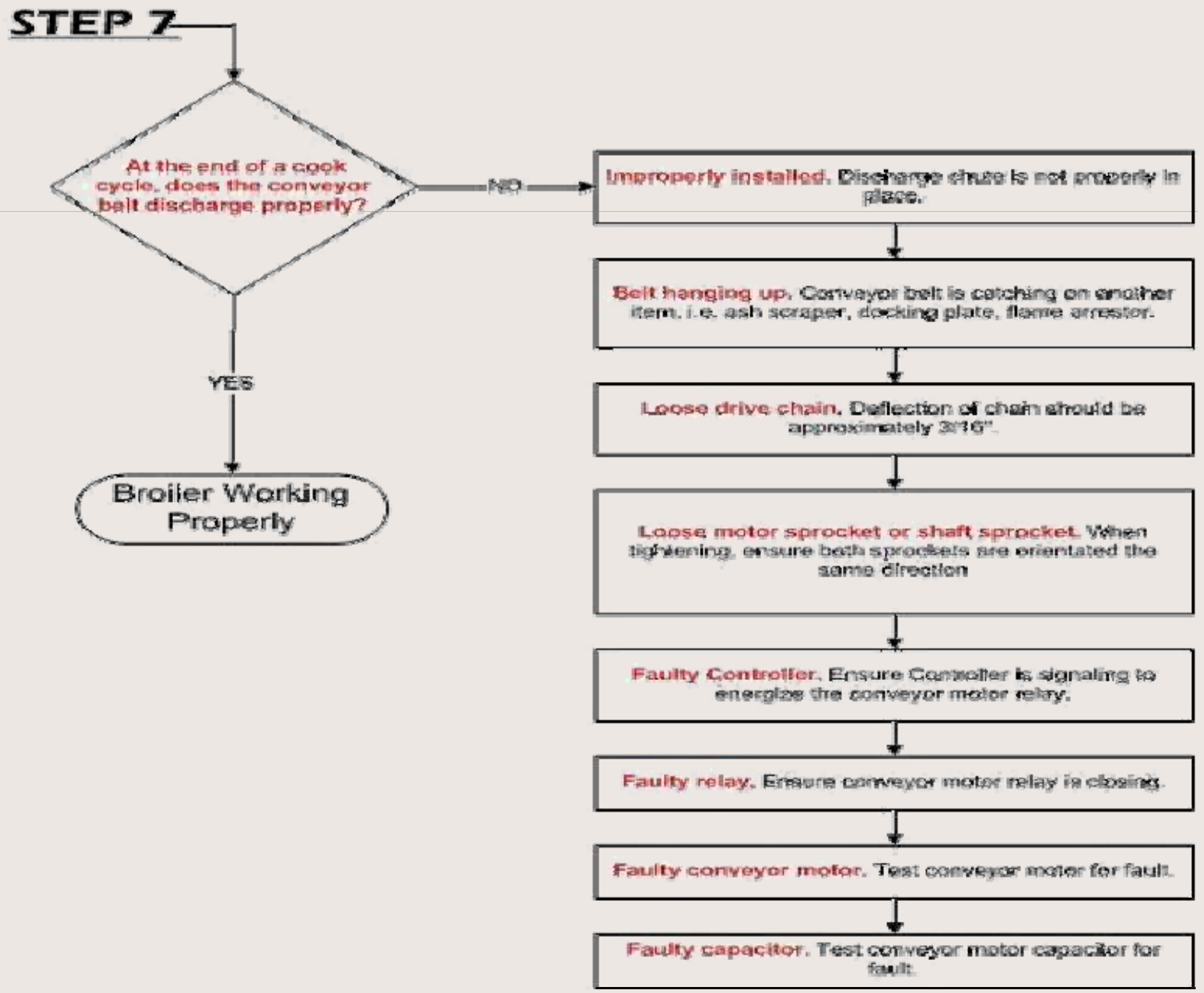

STEP 5
Does the Lower Burner cycle on and off to maintain idle temperature? (Typically 680 F)
NO
Display goes to "LO"
NO
Display goes to "GAS"
NO
Display goes to "PROB"
YES
YES
YES
See "LO", "GAS", or "PROB" on STEP 3
YES
STEP 6


STEP 6
During a cook cycle, do the upper burners cycle on and off according to the programmed cook cycle?
NO
No spark present at an upper burner.
NO
Spark present at both burners, but no ignition.
NO
Spark and ignition present on both burners, but burner(s) does not stay lit.
NO
Cycling of upper burners does not follow programmed cook cycle.
YES
STEP 7
YES
Faulty igniter or insufficient spark gap. Ensure upper igniters have sufficient spark gaps and spark is not arcing elsewhere.
Faulty Controller. Ensure Controller signals for heat to the upper ignition module.
Faulty ignition cable. Ensure continuity through affected ignition cable.
YES
No Gas. Ensure incoming gas supply is available.
Faulty ignition module. Ensure upper ignition module signals to open lower gas valve.
Faulty gas valve. Ensure gas valve solenoid energizes and gas is present at the upper burners.
Dirty burner. Ensure upper burner orifices are clear of debris.
YES
Dirty flame sensor. If sparking continues, regardless if ignition is present, clean the lower flame sensor.
Faulty Controller. Ensure Controller signals blower motor relay to close.
Faulty blower motor or relay. Ensure blower motor energizes and there is sufficient air traveling to the upper burners. Heavy accumulation of grease on the blower wheel can have adverse effects.
YES
Faulty Controller. Ensure Controller signals for heat to the upper ignition module at the appropriate periods during the cook cycle.
Faulty ignition module. Ensure upper ignition module is signaling to spark and open the upper gas valve at the appropriate periods during a cook cycle.

Troubleshooting
Step 6 Components

Upper Igniter-
Controller-
Upper Ignition Cable-
Upper Ignition Module-
Upper Gas Valve-
Blower Motor-
Blower Motor Relay-

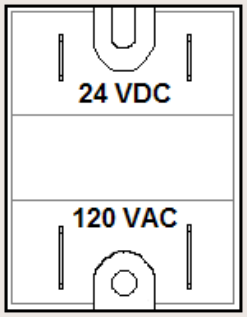
See prior page for component troubleshooting


STEP 7
At the end of a cook cycle, does the conveyor belt discharge properly?
NO
YES
Broiler Working Properly
Improperly installed. Discharge chute is not properly in place.
Belt hanging up. Conveyor belt is catching on another item, i.e. ash scraper, docking plate, flame arrestor.
Loose drive chain. Deflection of chain should be approximately 3/16".
Loose motor sprocket or shaft sprocket. When tightening, ensure both sprockets are orientated the same direction
Faulty Controller. Ensure Controller is signaling to energize the conveyor motor relay.
Faulty relay. Ensure conveyor motor relay is closing.
Faulty conveyor motor. Test conveyor motor for fault.
Faulty capacitor. Test conveyor motor capacitor for fault.

Troubleshooting
Step 7 Components

Controller-See slide #74 or #79

Conveyor Motor Relay



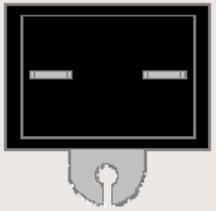
Input Voltage Check
24 VDC across wires 30 & 31 from controller

Output Voltage Check
120 VAC across wires 4 & 5

Other Relay Tests
-With 24 VDC input there should be 120 VAC across the output

-With 0 VDC input there should be approx. 0 VAC across output

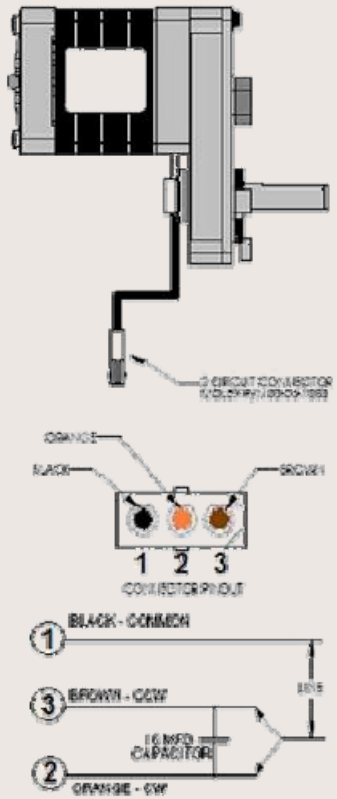
Motor Capacitor



Test: Discharge capacitor.
Resistance should measure low and drift to high ohms

Troubleshooting
Step 7 Components

Conveyor Motor



Input Voltage Test
120 VAC across motor leads

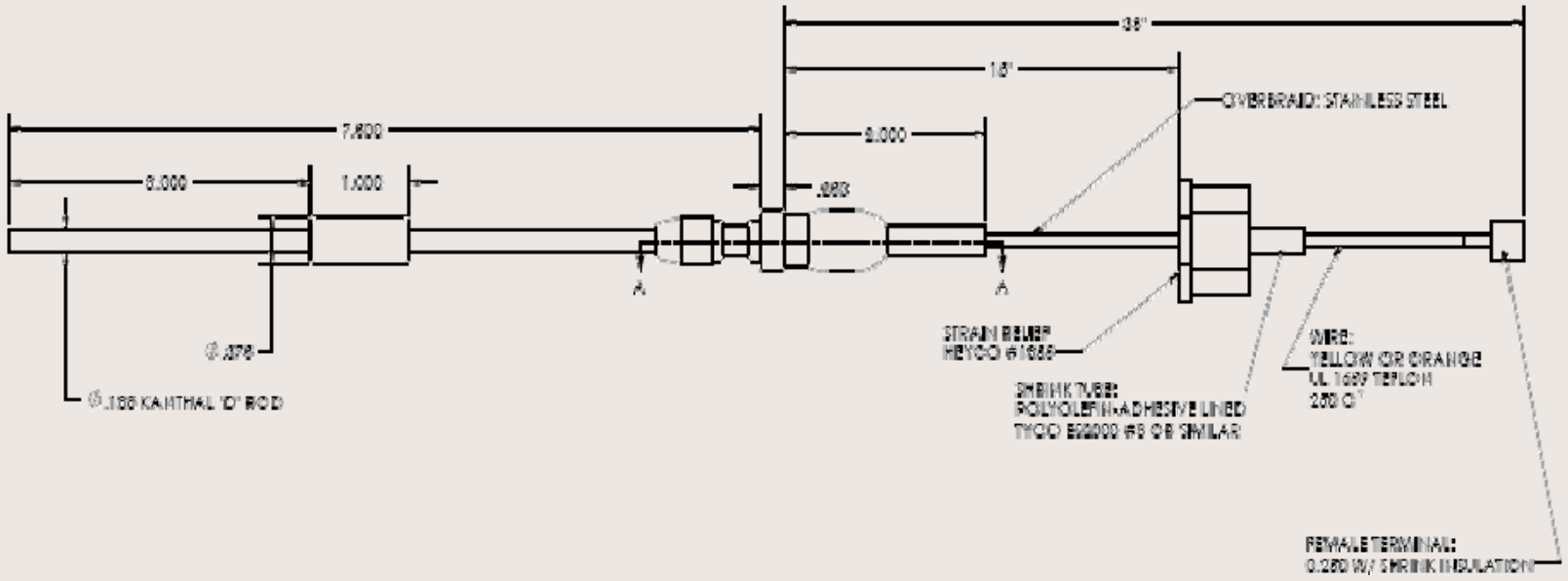
Output Voltage Test
With motor free from drive chain motor should run

Resistance Checks
Approx. Readings:
Black-Orange = 24.2 ohms
Black-Brown = 24.2 ohms
Orange-Brown = 49.2 ohms

Other Tests:
Continuity from the motor lead to motor casing would indicate a shorted winding

Troubleshooting
Upper Flame Sensor Check

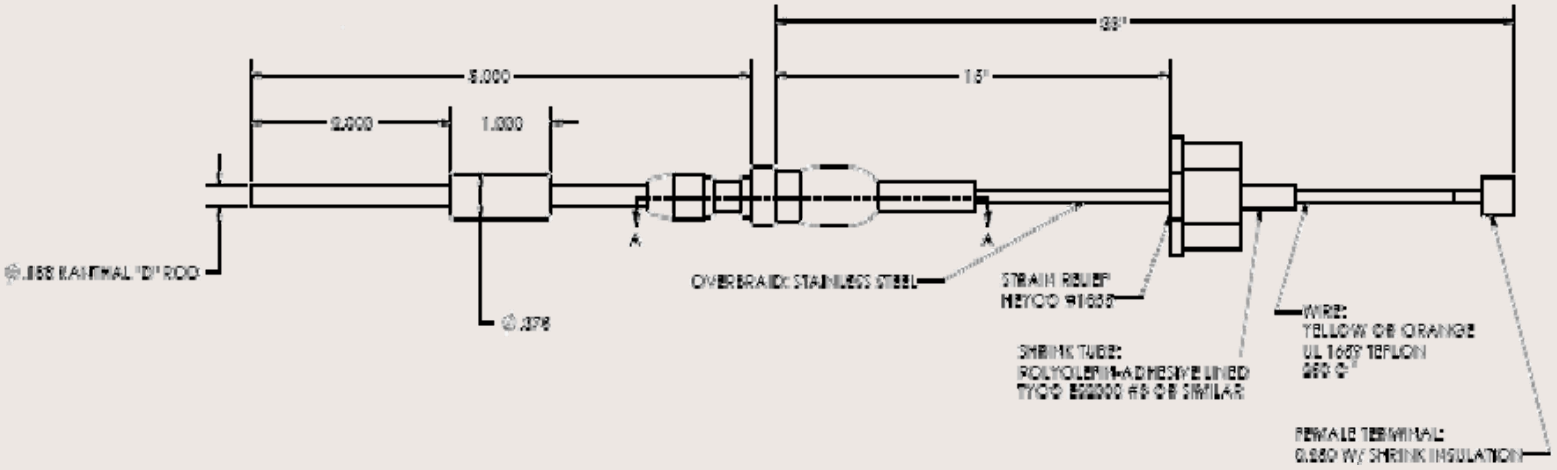
Upper Flame Sensor



Continuity from rod tip to terminal-closed

Troubleshooting
Lower Flame Sensor Check

Lower Flame Sensor



Continuity from rod tip to terminal-closed

Operator Maintenance

One of the most important aspects for proper operation of the batch broiler is operator maintenance.

4 HOUR CLEANING PROCEDURES

All components that are in contact with food product MUST be cleaned & sanitized every 4 hours while in use.
If meat well is directly under carriage, ensure it is closed while you perform cleaning procedures.

CAUTION: Hot surface near Loader Door!!!

DISLODGE CARRIAGE

Dislodge carriage from hinges and pull out slightly before cleaning.

LOADER

Using clean cloth with sanitizing solution, wipe loader bars. Rinse cloth if necessary.

CARRIAGE

Using same cloth with sanitizing solution, wipe carriage base. Rinse cloth. Repeat if necesssary. Apply sanitizing solution again to loader & carriage to sanitize.

OR

LOADER/CARRIAGE

Loader and carriage can also be removed for cleaning at the 3 compartment sink (*Wash, Rinse & Sanitize*)

AFTER PEAK CLEANING PROCEDURES

REMOVE

DISCHARGE HOOD

Slide hood up and out of keyhole slots.

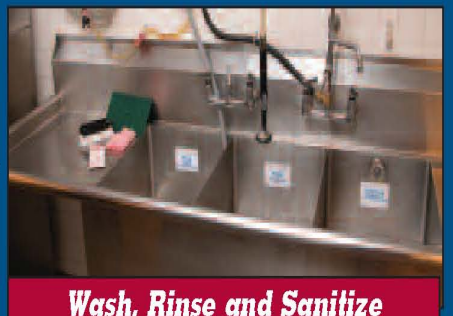
CAUTION: VERY HOT!
Use Heat Protective Gloves when removing

TO ACCESS

DISCHARGE PRODUCT SLIDE

Tilt up to un-hook and pull forward for removal.

CAUTION: VERY HOT!
Use Heat Protective Gloves when removing



Wash, Rinse and Sanitize
Discharge Product Slide ONLY

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BATCH BR-4 HOUR-E 09/06

DAILY CLEANING CARD

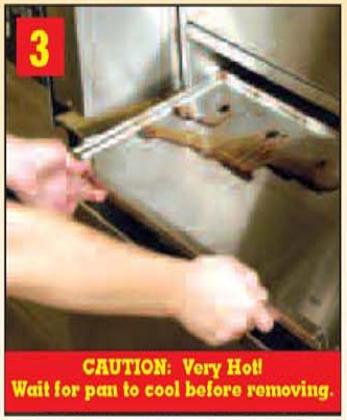
AFTER BROILER COOLS

CLEAN SAFE

Shut down broiler, disconnect power & let cool before performing daily cleaning.

LOADER
Slide Loader out and remove completely.

CARRIAGE
Dislodge carriage from hinges and pull out to remove.



LOWER GREASE PAN
Slide grease pan out of broiler.

"V" GREASE PAN
Slide "V" pan out of broiler.
Once clean, then KOTE interior of pan

PHU PAN SUPPORT
Loosen thumbscrews and slide up and out of keyhole slots

DISCHARGE HOOD
Slide hood up and out of keyhole slots. Once clean, then KOTE interior areas that are shaded **BLUE**

PHU PAN HOLDER
Loosen thumbscrews and slide pan up and out of keyhole slots.

DISCHARGE GREASE PAN
Tilt up to un-hook and pull forward for removal.

DISCHARGE PRODUCT SLIDE
Tilt up to un-hook and pull forward for removal.

SIDE PANEL REMOVAL
Tilt up to un-hook and pull forward for removal.
To replace: Metal tabs MUST face down

ASH SCRAPER
Pull forward and up to remove (push chain up slightly)

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BATCH BR-DAILY-E 06/06

AFTER BROILER COOLS

WEEKLY CLEANING CARD

Shut down broiler, disconnect power & let cool before performing weekly cleaning

CAUTION: Very Hot!
Wait for broiler to cool before removing parts!

BODY FRONT & BACK PANELS

Lift panels up and away from broiler.

Brush and clean excess buildup from interior bottom shelf. Clean in 3 compartment sink.

LOADER DOOR

Tilt and remove completely. Clean in 3 compartment sink.

DOCKING PLATE

Lift pin up and to the right. Angle forward. Remove from slot. Spray with REMOVE™ Oven Cleaner and soak. KOTE on edge and underneath.

FLAME ARRESTOR

Dislodge from tabs, shift down and remove completely. Spray with water and brush with scraper brush. Spray with REMOVE™ Oven Cleaner on front edge.

RE-ASSEMBLE FLAME ARRESTOR

With leading edge and at an angle, shift down and slide back in.

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LOADING PROCEDURES

1 Check RDY & if Red Light is OFF

PLACE PRODUCT ON LOADER

PUSH LOADER STRAIGHT INTO BROILER

PUSH HANDLE DOWN

PULL LOADER OUT

SELECT PRODUCT IMMEDIATELY

PLACE PHU PAN IN DISCHARGE AREA

GUIDELINES

- TENDERGRILL®: Heavy Glaze Side Up
- Burgers: Arrange in Same Direction
- Stage Next Load While Another is Cooking

BATCH LIMITS

WHOPPER® and TENDERGRILL®: 8

Burgers: 12

Angus: 6

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CRITICAL FOOD SAFETY ITEM

FLEXIBLE BATCH BROILER

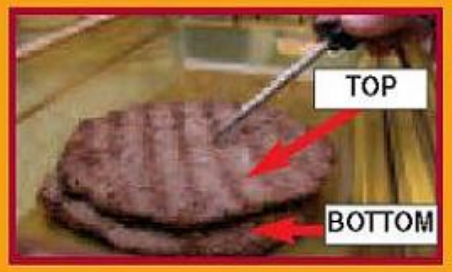
BEEF COOK-OUT INSTRUCTIONS

WHOPPER® AND BURGER PATTIES

- SANITIZE both the temperature probe and PHU pan.

- Prior to placing the meat on the loader, place the PHU pan in the discharge area of the broiler.

- PLACE 2 PATTIES ON THE LOADER, while facing the feed side of the broiler, both patties should be placed on the far left side of the carriage. The first patty in the section closest to the cook chamber and the second patty in the section directly behind the first.

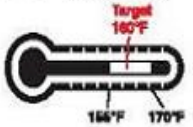


- ALLOW THE PATTIES TO FALL INTO THE PHU PAN.
  Let both patties release from the cooking chain into a clean and sanitized standard restaurant PHU pan.

- IMMEDIATELY pick up the patty that was closest to the cook chamber (TOP) and place it over the patty that was directly behind it (BOTTOM).

- MEASURE THE TEMPERATURE OF THE TOP PATTY ONLY BY INSERTING TIP OF PROBE IN CENTER OF TOP PATTY AT ABOUT A 45° ANGLE. Do not allow the probe to penetrate completely through the bottom of the top patty.

- PATTY MUST STAY IN 155° – 170° F (68° – 77°C) RANGE (for at least 15 seconds)
- THE TARGET COOK-OUT TEMPERATURE IS 160° F (71°C)
- IF PATTY PASSES THE TEST …
  Place patties (in pan) in the PHU.



- IF PATTY FAILS THE TEST…
  Discard test patties and any other patties cooked at the same time. Clean and sanitize both the thermometer probe and PHU pan. Adjust cook time and repeat the test until satisfactory cook out temperature is achieved.

COOK-OUT Batch 04/06

EVERY RESTAURANT MUST COMPLETE A COOKOUT AT LEAST 4 TIMES PER DAY AND RECORD. WITHOUT EXCEPTION, THE LENGTH OF TIME BETWEEN COOKOUTS MAY NOT EXCEED 4 HOURS.

- AM Calibration: 40 minutes after turning on the broiler & prior to serving any Guest product cooked on the broiler
- Broiler Peak: During the lunch period, under heavy broiler load conditions
- Before Dinner: After lunch or before dinner
- After Dinner: No longer than 4 hrs. after the pre-dinner cookout
- Late Night: For restaurants open past midnight, a cookout must be completed between midnight & 1 AM, regardless of when the prior cookout took place
- 24 Hour Operation: An additional cookout is required at 4 AM

Parts

Burger King is offered an optional spare parts kits for the restaurants use in case of emergency or out of warranty repairs. These parts are not to be used under warranty unless first approved by Duke Mfg.

For warranty purposes Duke Mfg. requires all authorized service agents to use company stock. The purpose of offering a spare parts kits is for out of warranty repair or in cases where the restaurant has caused non warranty related damage to the broiler.

Example: dropped and damaged burner during cleaning, water damage etc

Recommended Spare Parts

Truck Stock

Critical Burger King Broiler Parts List Minimum Truck Stock Inventory		
Qty	Part #	Description
1	175503	Switch, Lighted, DSPT 16GA@125V
1	175506	Motor, Conveyor
1	175507	Capacitor, Motor-Conveyor
1	175508	Module, Ignition (Lower)
1	175509	Module, Ignition (Upper BRN)
1	175516	Transformer, 40VA, 120 VAC-24 VAC
1	175518	Probe, Temp, C-Chamber
2	175519	Relay-Solid State
1	175575	Control (FAS16) (RoHS)
1	175524	Blower, Dayton 60 Hz 115v
1	175531	Valve, Nat-Gas Combo 120v
1	175534	Sensor-Lower Burner
2	175535	Sensor-IR Burner
2	175536	Ignitor
1	175537	Ignition Supression Cable-IR (18 1/2")
1	175538	Ignition Supression Cable-Lower (8")

Recommended Spare Parts
"GRAB & GO BOX"

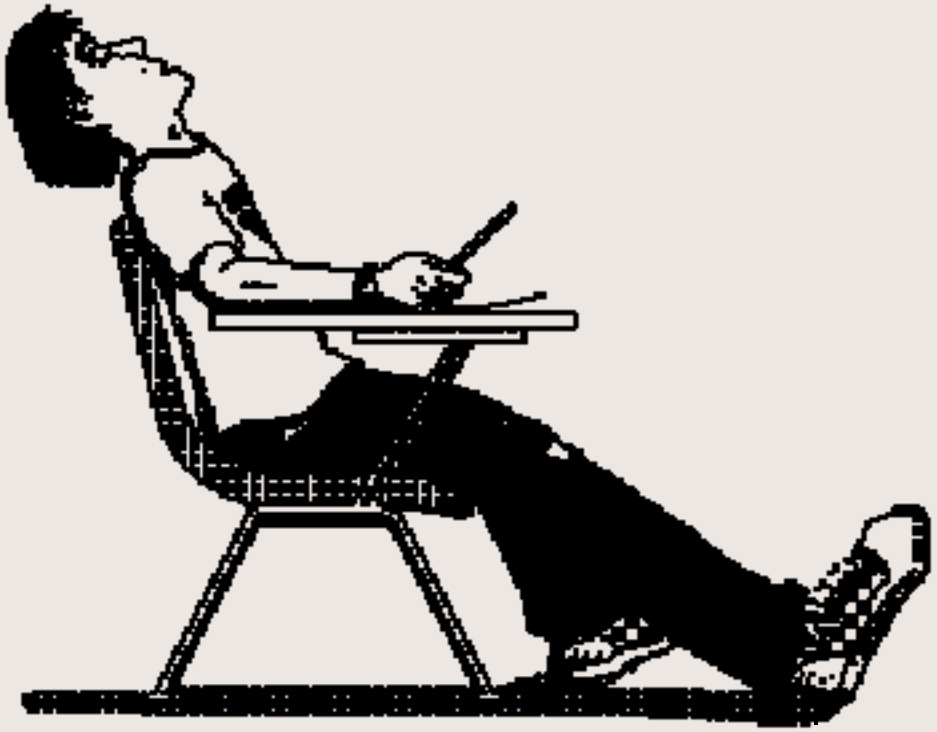
Critical Burger King Broiler Parts List		
Grab and Go Box		
Qty	Part #	Description
1	175503	Switch, Lighted, DSPT 16GA@125V
1	175506	Motor, Conveyor
1	175507	Capacitor, Motor-Conveyor
1	175508	Module, Ignition (Lower)
1	175509	Module, Ignition (Upper BRN)
1	175516	Transformer, 40VA, 120 VAC-24 VAC
1	175518	Probe, Temp, C-Chamber
2	175519	Relay-Solid State
1	175575	Control (FAS16) (RoHS)
1	175524	Blower, Dayton 60 Hz 115v
1	175531	Valve, Nat-Gas Combo 120v
1	175534	Sensor-Lower Burner
2	175535	Sensor-IR Burner
2	175536	Ignitor
1	175537	Ignition Supression Cable-IR (18 1/2")
1	175538	Ignition Supression Cable-Lower (8")

Recommended Spare Parts

Service Warehouse Stock

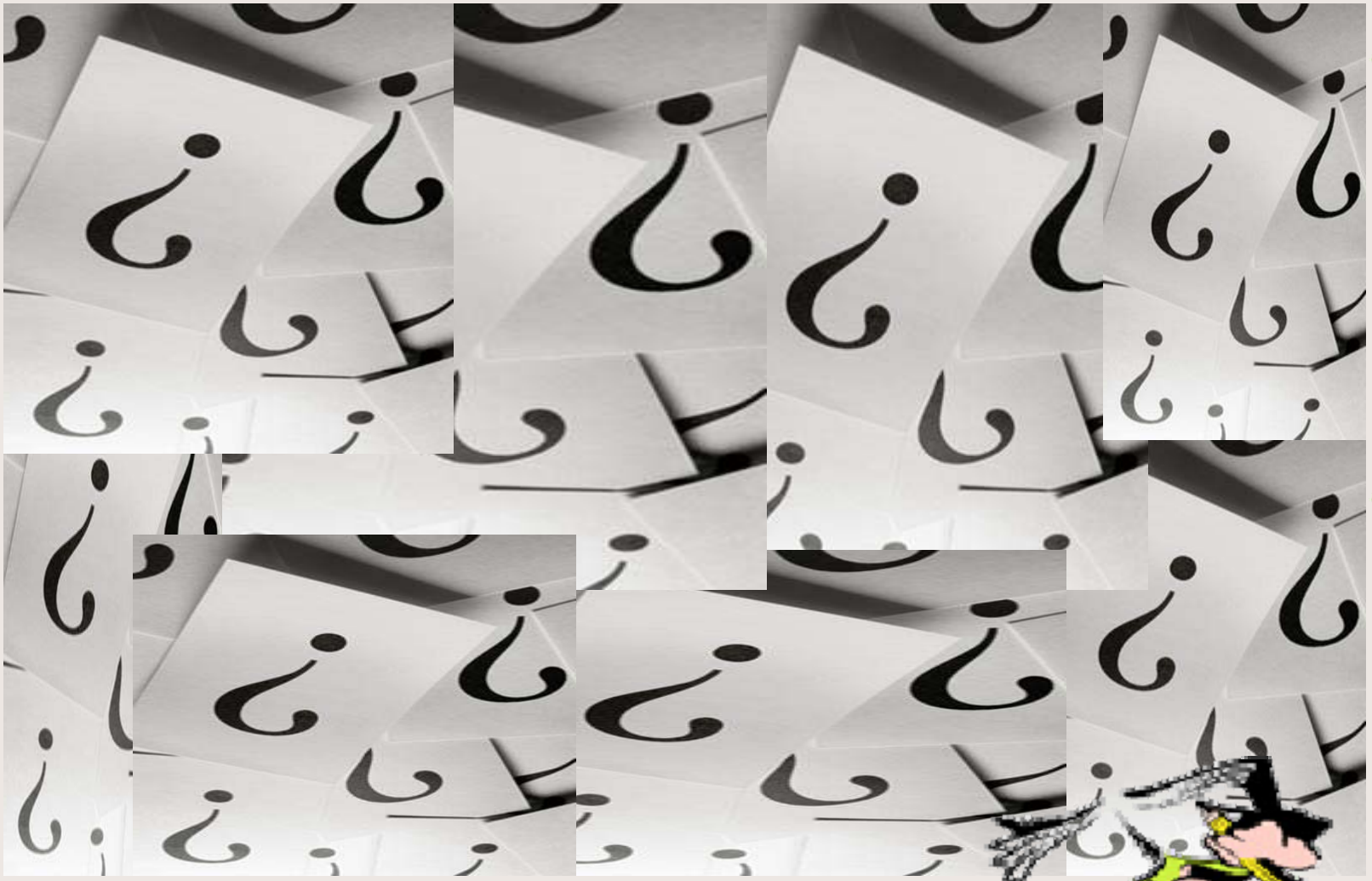
Critical Burger King Broiler Parts List		
Minimum Service Agency Warehouse Inventory		
Qty	Part #	Description
1	175503	Switch, Lighted, DSPT 16GA@125V
1	175504	Burner, Infrared
1	175505	Burner, Tube, J Style
1	175506	Motor, Conveyor
1	175507	Capacitor, Motor-Conveyor
1	175508	Module, Ignition (Lower)
1	175509	Module, Ignition (Upper BRN)
1	175516	Transformer, 40VA, 120 VAC-24 VAC
1	175518	Probe, Temp, C-Chamber
2	175519	Relay-Solid State
1	175551	Chain, Drive
1	175575	Control (FAS16) (RoHS)
1	175524	Blower, Dayton 60 Hz 115v
1	175531	Valve, Nat-Gas Combo 120v
1	175534	Sensor-Lower Burner
2	175535	Sensor-IR Burner
2	175536	Ignitor
1	175537	Ignition Supression Cable-IR (18 1/2")
1	175538	Ignition Supression Cable-Lower (8")
1	175674	Chain, Cook 70" FBB
1	175340	Weldment, Burger Stripper
1	175444	Weldment, Spatula All
1	175275	Weldment, Flame Arrestor
1	175200	Weldment, Burner Shield
1	175432	Weldment, Threshold
4	175525	Bushing Block, Conveyor

10 Minute Break



Review

BK Broiler Interactive Training CD



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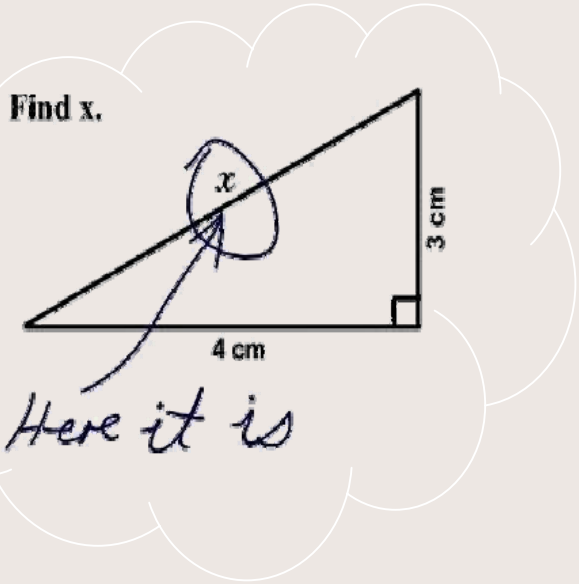
Test Time

30 Minutes



Certification